MANAGEMENT TECHNIQUES

A BIBLIOGRAPHY

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INTRODUCTION TO MANAGEMENT BIBLIOGRAPHY

This publication is one of a series prepared by the Wayne State University Center for Application of Sciences and Technology (CAST) to aid in the transfer of aerospace-related science and technology compiled by the National Aeronautics and Space Administration (NASA). It contains selected abstracts pertaining to the field of management that have been compiled from Scientific and Technical Abstracts (STAR) and International Aerospace Abstracts (IAA) through December, 1966. Supplemental additions to this Management Bibliography will be published annually.

THIS BIBLIOGRAPHY IS COMPOSED OF THREE SECTIONS:

SECTION 1 - gives the general areas covered in the management bibliography and some keywords to be used in using the KWOC (Keyword Out-of-Context-Index) in Section 2.

SECTION 2 - contains the KWOC index of specific management areas, document titles, and the related accession number.

SECTION 3 - contains a chronological listing of the abstracts in accession number order. Page 2 of this introduction gives an illustration of how to use each section.

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Order documents by accession numbers, i.e., "N64-18450".

GUIDE TO MANAGEMENT BIBLIOGRAPHY

SECTION I - contains a list of suggested keywords in certain areas of management. For example, under the broad area of PLANNING is the keyword, estimating.

PLANNING budgeting, cost effectiveness, estimating, forecasting, funding, long-range-planning, programming, scheduling
Objectives, performance requirements
PERT, CPM, PERT/cost, critical path

SECTION II - contains a Keyword Out-of-Context index. Under this section there are references and titles entered for the keyword, estimating.

N64-18450 ESTIMATING
A TECHNIQUE FOR ESTIMATING FUNDING AND MANPOWER REQUIREMENTS FOR RESEARCH DEVELOPMENT L NG-RANGE PLANNING. /TECHNIQUE ESTIMATING FUNDING REQUIREMENTS LONG-RANGE-PLANNING R-+-D/

N66-33837 ESTIMATING
PROCEDURES FOR ESTIMATING THE RESOURCE REQUIREMENTS OF MANNED SPACE FLIGHTS. /ESTIMATING RESOURCE SPACE-FLIGHTS NASA/

SECTION III - contains the abstracts listed in chronological order by "A" and "N" numbers.

This gives reference to abstract number N64-18450 which is found in Section III.

N64-18450* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
A TECHNIQUE FOR ESTIMATING FUNDING AND MANPOWER REQUIREMENTS FOR RESEARCH AND DEVELOPMENT LONG-RANGE PLANNING

Frank E. Goddard, Jr., William H. Bayley, David K. Carlisle, James R. Edberg, and Fred H. Felberg 8 Nov 1962 19 p
(NASA Contract NAS7-100)
(NASA CR-53571; JPL Planning Rept. 35-6 (Rev. 1)) OTS: $1.60 ph

This report outlines the technique that has evolved from a study of the long-range programing problem. The material is extracted from an internal planning report and is presented only as one method by which estimates of resource requirements can be made. Charts and figures required to understand the technique are presented, together with a simplified step-by-step procedural example showing how estimated requirements are determined for a given project that, in itself, is a component part of a program and of the overall installation effort. Author

N64-18926 California U., Berkeley Operations Research Center
NOTES ON OPERATIONS RESEARCH - 2
27 Sep. 1963 29 p refs
(Contract Nonr-222(83))
(ORC-63-23(RN-4); AD-434782)

L. Schwartz Mar. 1964 32 p. refs
(FDL-TDR-64-21, AD-437895)

A single-axis satellite attitude control system is used as an example for the application of several optimization techniques. The vehicle and actuator dynamics are linear, and the performance criterion is quadratic (related to minimum-energy control). The techniques used are the classical calculus of variations, the maximum principle, dynamic programing, and steepest descent. Author

N64-21601 Federal Council For Science and Tech., Washington, D.C.
CURRENT PROBLEMS IN THE MANAGEMENT OF SCIENTIFIC PERSONNEL
[1963] 125 p Proc. of the First Symp., 17-18 Oct. 1963

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2. CAREER DEVELOPMENT OF FEDERAL SCIENTISTS AND ENGINEERS—II. INCENTIVES AND EVALUATION F. J. Weyl (ONR) p 28-45 (See N64-21603 15-01)

3. CAREER DEVELOPMENT OF FEDERAL SCIENTISTS AND ENGINEERS—III. THE SENIOR SCIENTIST H. J. Goett (NASA) p 46-69 (See N64-21604 15-01)

Section 1

SECTION 1

BEHAVIORAL SCIENCES	attitudes, creativity, motivation, psychology, social science.
COMPUTERS	Automation Analog Computer, Numerical Control, APT Computer Program, Computer Programming Cybernetic Data Processing ADP, IBM 1401-1410-7090 Systems time sharing, real time, remote consoles
CONTROL	Inventory control, production control, quality control, PERT, CPM, Scheduling, PERT/cost, critical-path, cost reduction policies, procedures
DECISION MAKING	decision theory, information, information systems problems, problem-solving, statistics.
ECONOMICS	capital, capital equipment, capital investment, consumption, growth cost, cost analysis, price
EDUCATION	career, learning, simulation, training
ENGINEERING	design, maintainability, reliability, system-design, system, technology, value-analysis
INFORMATION	decision making, information processing, information retrieval, information systems
MANAGEMENT FUNCTIONS	accounting, auditing, engineering, finance, industrial engineering, marketing, personnel, production, production-control, production scheduling, quality control, research, R&D.
MANAGEMENT TECHNIQUES	operations research linear programming, simplex method, resource allocation mathematical model, model Queueing theory, quantitative simulation, game theory systems analysis, systems design
PLANNING	budgeting, cost effectiveness, estimating, forecasting, funding, long-range-planning, programming, scheduling Objectives, performance requirements PERT, CPM, PERT/cost, critical path
PRODUCTION	automation, control, evaluation, manufacturing mechanization, work

Section 2

N66-26780 ADMINISTRATION
INDUSTRIAL-SCIENCE ADMINISTRATION PERSONNEL LOGISTICS MATERIALS-PLANNING/

A64-16870 ADMINISTRATIVE-RECORDS
MANAGEMENT TECHNIQUES APPLICABLE TO SYSTEMS TEST PROGRAMS /MANAGEMENT-TECHNIQUES SYSTEMS DATA-DOCUMENTATION ADMINISTRATIVE-RECORDS/

N66-16001 ADP
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N65-27316 ADVANCED
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A66-27301 ADVANCED-DESIGN
MANUFACTURING ENGINEERING - A PARTNER IN ADVANCED DESIGN. /MANUFACTURING-ENGINEERING ADVANCED-DESIGN NEW-PRODUCTS/

N65-23967 ADVANCED-PROJECTS
PRINCIPLES OF INTERFACE MANAGEMENT IN ADVANCED PROJECTS. /PRINCIPLES INTERFACE ADVANCED-PROJECTS/

A63-18028 ADVENT
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N63-20021 AERO-ENGINE
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A65-31568 AERO-SPACE
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A65-25511 AERODYNAMIC
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A65-12837 AEROSPACE
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A65-24154 AEROSPACE
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A66-30400 AEROSPACE
AN ANALYTICAL CONCEPT FOR THE SELECTION, FLOW, AND TRANSFERENCE OF TECHNOLOGY IN A LARGE ELECTRONICS

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N64-16114 AEROSPACE
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N66-31894 AEROSPACE
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N66-30756 AEROSPACE-INDUSTRY
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N65-19928 AEROSPACE-PROGRAM
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N66-17706 AEROSPACE-TECHNOLOGY
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A63-13075 AGE
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N63-12833 AID
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NASA PATTERN RELEVANCE GUIDE - VOLUME 1.* GENERAL, SPACE SCIENCE AND UTILIZATION. /NASA UTILIZATION SPACE-SCIENCES MANAGEMENT-PLANNING/

A65-23604 VALUE
VALUE CONTROL FOR SYSTEM DESIGN. /VALUE CONTROL SYSTEM-DESIGN COST-EFFECTIVENESS/

A63-23311 VALUE-ANALYSIS
INTERFACES BETWEEN RELIABILITY AND VALUE ANALYSIS. /INTERFACES RELIABILITY VALUE-ANALYSIS/

A64-25180 VALUE-ANALYSIS
VALUE ANALYSIS AS APPLIED TO A RESEARCH AND DEVELOPMENT PROGRAM. /VALUE-ANALYSIS R+D/

A65-18752 VALUE-ANALYSIS
CUSTOMERIZING RELIABILITY PROGRAMS. /RELIABILITY VALUE-ANALYSIS/

A64-25181 VALUE-ENGINEERING
IMPLEMENTING VALUE ENGINEERING DURING SYSTEM-DESIGN AND DEVELOPMENT. /VALUE-ENGINEERING SYSTEM-DESIGN COST R+D/

A65-17078 VALUE-ENGINEERING
VALUE ENGINEERING AND THE VTOL. /VALUE-ENGINEERING VTOL COST-REDUCTIONS/

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N66-25948 VALUE-ENGINEERING
CRITERIA FOR VALUE ENGINEERING - PHASE 1., FEASIBILITY STUDY. /VALUE-ENGINEERING QUANTITATIVE-ANALYSIS/

N66-36541 VALUE-ENGINEERING
THE COMPATIBILITY OF VALUE ENGINEERING AND CONFIGURATION MANAGEMENT. /VALUE-ENGINEERING CONFIGURATION-MANAGEMENT/

A66-42094 VERIFICATION
OPERATIONAL EFFECTIVENESS AND MAINTAINABILITY VERIFICATION FOR SURVEILLANCE AND CONTROL SYSTEMS. /MAINTAINABILITY OPERATIONAL-EFFECTIVENESS VERIFICATION SURVEILLANCE CONTROL-SYSTEMS/

A65-24155 VISIBILITY
SCOPE - MANAGEMENT VISIBILITY AND CONTROL SYSTEM. /SCOPE MANAGEMENT VISIBILITY CONTROL SUMMARIES/

N66-17698 VISUAL-DISPLAY
YOU CAN ALWAYS TELL A COMPUTER BUT YOU CAN-T TELL IT MUCH. /COMPUTER-PROGRAMMING COMPUTER INFORMATION VISUAL-DISPLAY/

N66-21080 VOYAGER
VOYAGER SPACECRAFT SYSTEM - PRELIMINARY DESIGN, VOLUME A, BOOK 4A OF 4.* FLIGHT SPACECRAFT PREFERRED DESIGN - IMPLEMENTATION PLANS. /VOYAGER SPACECRAFT PROJECT-MANAGEMENT/

N66-21081 VOYAGER
VOYAGER SPACECRAFT SYSTEM - PRELIMINARY DESIGN, VOLUME A, BOOK 4B OF 4.* IMPLEMENTATION PLAN. /VOYAGER SPACECRAFT/

A65-17078 VTOL
VALUE ENGINEERING AND THE VTOL. /VALUE-ENGINEERING VTOL COST-REDUCTIONS/

N62-17220 WAITING
ECONOMIC MODELS FOR INDUSTRIAL WAITING LINE PROBLEMS. /ECONOMIC-MODELS WAITING LINE QUEUEING THEORIES/

A64-11645 WEAPON-SYSTEM
STEEP - THE SYSTEM TEST AND EVALUATION EXPEDITING PROCEDURE. /STEEP SYSTEM EVALUATION PROCEDURE CONTROLS WEAPON-SYSTEM/

N62-13386 WEAPONS-SYSTEMS
THE ROLE OF MECHANIZATION IN MANAGEMENT. /MECHANIZATION MANAGEMENT WEAPONS-SYSTEMS/

N65-22034 WHIRLPOOL
WHIRLPOOL, A COMPUTER PROGRAM FOR ,,SORTING OUT,, INDEPENDENT VARIABLES BY SEQUENTIAL MULTIPLE LINEAR REGRESSION. /WHIRLPOOL COMPUTER-PROGRAM MULTIPLE-LINEAR-REGRESSION/

A65-31140 WIRING-DATA
A PROPOSED MILITARY STANDARD 'AUTOMATICALLY PROCESSED WIR
DATA AND DIAGRAMS.' /WIRING-DATA DIAGRAMS COMPUTER
DATA-PROCESSING/

N64-16667 WORK
ORGANIZATION OF WORK IN ENGINEERING PSYCHOLOGY IN THE USA
/ORGANIZATION WORK ENGINEERING PSYCHOLOGY/

N65-30279 WORK
PROBLEMS OF THE MECHANIZATION OF MANAGEMENT WORK. /PROBLE
MECHANIZATION MANAGEMENT WORK ACCOUNTING PLANNING/

N65-29233 WORKSHOP
A WORKSHOP SCHEDULING PROCEDURE. /WORKSHOP SCHEDULING
PROCEDURE/

N64-16114 WORKSHOPS
JOINT INDUSTRY GOVERNMENT FORUM AND WORK-SHOPS.-THE
AEROSPACE RELATIONSHIP, SEPTEMBER 16 - 17 1963, WASHINGTO
. /INDUSTRY GOVERNMENT FORUM WORKSHOPS AEROSPACE/

N65-31427 WORKSHOPS
EXPERIENCE OF DESIGNING OF GROUP TREATMENT OF PARTS IN
MECHANICAL WORKSHOPS OF AIRCRAFT BUILDING FACTORIES.
/DESIGNING PARTS MECHANICAL WORKSHOPS AIRCRAFT FACTORIES/

A66-38482 ZERO-OR-MINIMUM-DEFECTS
THE ECONOMICS OF A ZERO OR MINIMUM DEFECTS PROGRAM.
/ECONOMICS ZERO-OR-MINIMUM-DEFECTS/

N66-29269 1401-COMPUTER
GENERALIZED FORM CONTROLLED INPUT PROGRAM. /PROGRAM FORMA
1401-COMPUTER PAPER-TAPE/

N65-14050 7090-COMPUTER
USER-S MANUEL FOR THE COMPUTERIZED ELECTRONIC SYSTEM COS
MODEL. /COST-MODEL DATA-PROCESSING 7090-COMPUTER/

N65-28148 7090-COMPUTER
THE APPLICATIONS OF COMPUTERS TO THE APL STORAGE AND
RETRIEVAL SYSTEM. /COMPUTERS STORAGE RETRIEVAL-SYSTEM
IBM-1401 7090-COMPUTER/

N62-10312 Advanced Electronics Center, General Electric Co., Ithaca, N. Y.

OPERATIONS RESEARCH ON RECOGNITION.

Final Report Covering Period 1 March 1960 through 1 December 1961.

Robert D. Turner. [January 1962] vii, 68 [5]p. 7 refs. (AFCRL-62-52) (Project 4691; Contract AF 19(604)-6103) Research sponsored by Air Force Cambridge Research Labs. Electronics Research Directorate, Bedford, Mass.

The major emphasis in this study is on the dynamic or learning aspects of recognition and on a recognition device suitable for use in a dynamic action-selection environment. Study results show that most of the elements of a recognition device are in sight. Such functions as cross-sensor association, data storage and retrieval, image refinement, and the various decision processes associated with controlling the flow of data and modification of classification processes can be implemented, although not with great efficiency at the present time. Also it is possible to establish a logical framework for the dynamic recognition process. Construction of such a framework would have far-reaching implications. First, the synthesis techniques employed could be applied to the situation-evaluation and action-selection processes as well. The eventual result would be a logical framework in which practical action-selection systems could be synthesized and analyzed. Thus, for example, the basis would be made available for evaluating and optimizing existing and future command and control systems, ensuring the "best possible" responses, in the sense that the responses would maximize achievement of system goals while making the most efficient use of the resources required to achieve those goals.

N62-17220 Applied Mathematics and Statistics Labs., Stanford U., Calif.

ECONOMIC MODELS FOR INDUSTRIAL WAITING LINE PROBLEMS

Frederick S. Hillier Aug. 27, 1962 36 p 17 refs
(Contract Nonr-225(53))
(Tech. Rept. 62)

This paper provides useful applications for queueing theories by introducing a basic framework of economic models and accompanying procedures for solving industrial waiting line problems. The first model presented is for the simple case where the arrival rate and service rate are fixed and the number of servers (service channels) must be determined. Model 2 is for the case where both the arrival rate and the number of servers must be determined, i.e. where both the number of service facilities to distribute among the entire population and the number of servers to assign to each facility must be determined. This model is inclusive of travel time costs. Model 3 is for the case where both the service rate and the number of servers must be determined. Several special cases of both Model 2 and Model 3 are analyzed. The models presented, while perhaps the most basic and most generally applicable ones, are far from exhaustive. In particular, models designed especially for specific types of industrial waiting line problems need to be developed. P.F.E.

N62-13386 Lockheed Aircraft Corp., Burbank, Calif.

THE ROLE OF MECHANIZATION IN MANAGEMENT.

Stanley W. Burriss. N.Y., Inst. of the Aerospace Sciences [1962] 7 p. Presented at the IAS National Summer Meeting, Los Angeles, June 19-22, 1962.
(IAS Paper 62-157) IAS: $0.50 members, $1.00 nonmembers.

Although the basic functions of management of a weapons system do not differ from the functions of any other kind of management, the size of the job and the limited time available for the inculcation of personnel set weapons systems management apart. The problem is not the complexity in detail; it is the complexity in volume of detail. Therefore, mechanization of data acquisition is becoming an increasingly important tool for management; but the functions of organizing, staffing, planning, directing, and controlling cannot be avoided by the successful manager, regardless of the extent to which he is backed up by automatic systems. Weapons systems managers must decide to what degree their procedures will be mechanized. If they go too far too soon, they have failed; and, if they don't go far enough, they have failed. Faced with these black and white alternatives, the answer is grey. (M.P.G.)

N62-16057 Office of the Secretary of Defense, Washington, D.C.

DOD AND NASA GUIDE. PERT/COST SYSTEMS DESIGN.

June 1962. 150 p. refs.
GPO: $0.75.

The Performance Evaluation and Review Technique (PERT) System is expanded to incorporate the schedule and cost data needed by contractor and government management to identify present and projected trouble spots. (R.C.M.)

N62-16407 Atomic Energy Commission. Div. of Technical Information, Washington, D.C.

CRITICAL PATH SCHEDULING: A PRELIMINARY LITERATURE SEARCH.

Hugh E. Voress, Elmer A. Houser, Jr., and Fred E. Marsh, Jr., comps. July 1962. 36 p. 305 refs.
(TID-3568(Rev. 1)) OTS: $0.75.

This report is a revised bibliography of 305 references concerning the Critical Path Scheduling planning technique (also known as PERT, PEP, and LESS). (V.D.S.)

N62-16582 Institute for Social Research, U. of Mich., Ann Arbor.

TIME AND INFLUENCE FACTORS IN LABORATORY MANAGEMENT, AS RELATED TO PERFORMANCE. Interim Technical Report, Analysis Memo #18.

Donald C. Pelz. Sept. 1962. 53 p. refs.
(Grant DA-ORO(D)-31-124-G160)
(AROD-0010-6)

The Multiple Classification Analysis (MCA) program was applied to study the relationships of 34 questionnaire measures to five performance scores. Because of certain flaws in procedure, only part of the MCA output is meaningful, but the raw data for all measures can legitimately be examined. The data tentatively suggest that scientists perform better when they devote about two-thirds of their time (not more) to technical work, and the rest to teaching or administration. Performance also tends to be high when some time is spent in research, some in development, and a little in technical services—in short, when time is balanced among several technical functions. Better performance occurs when influence on important decisions does not rest solely with the scientist nor any other individual, but is shared with several persons at various levels. (Author Abstract)

N62-17602 Joint Publications Research Service, Washington, D.C.

ON THE OPTIMAL USE OF PRODUCTIVE ASSETS IN PERFORMING SEVERAL KINDS OF OPERATIONS (GENERALIZED TRANSPORTATION PROBLEM)

M. K. Gavurin, G. Sh. Rubinshteyn, and S. S. Surin Oct. 1, 1962 44 p 5 refs Transl. from Sibirskiy Mat. Zhur. (Novosibirsk) v. 3, no. 4, July-Aug. 1962 p 481-499
(JPRS-15523) OTS: $4.60

The optimal use of productive assets is formulated to guarantee the necessary volume of freight for ships. The problem of reinforcement of a ship for a single voyage is considered for m different productive assets and n kinds of operation. The productivity, a_{ij}, of each asset, i, with respect to each type of operation, j, and the operational expenditures, b_{ij}, associated with the use of asset i in operations of type j, are known quantities for the period of time under consideration. The plan for use of the assets consists of indicating what proportion, x_{ij}, of the total period will be occupied by each asset i in the fulfillment of the operations of various types. A permissible plan for the solution of the problem is formulated,

$$x = |x_{ij}| \begin{matrix} i = 1,\ldots,m \\ j = 1,\ldots,n \end{matrix}$$

The theory of linear programing is used to construct algorithms for optimizing this plan. An expanded matrix is developed consisting of a system of m + n linear equations containing less than m + n values of x_{ij} distinct from zero. R.C.M.

A63-10176
A TECHNIQUE FOR MANAGEMENT OF MULTIPLE PROGRAMS IN A MEDIUM SIZE ENGINEERING DEPARTMENT.
B. W. Goldberg (Bendix Corp., Utica Div., Utica, N.Y.)
Society of Automotive Engineers, National Aerospace Engineering & Manufacturing Meeting, Los Angeles, Calif., Oct. 8-12, 1962, Paper 576B. 8 p.

Description of a practical approach to the control of fiscal and technical progress for multiple unrelated engineering projects. The technique incorporates six basic steps: (1) definition of the goals or the project aim; (2) preparation of the engineering estimate; (3) preparation of the project plan; (4) periodic review and evaluation of each project; (5) correlation and coordination of individual projects into the overall engineering operation; and (6) presentation to corporate management.

A63-10177
GRAPHIC PERT/COST MILESTONE REPORTING.
R. K. Swim (North American Aviation, Inc.)
Society of Automotive Engineers, National Aerospace Engineering & Manufacturing Meeting, Los Angeles, Calif., Oct. 8-12, 1962, Paper 576D. 3 p.

Description of a simple, direct, and flexible system of associating costs with program milestones. This system, the PERT milestone system, provides a basis for summarization of PERT schedule data for various levels of management, from the detail components through the weapon system levels. The concept of the system is described along with its application.

A63-10806
PERT IN THE DYNA-SOAR.
Theodore L. Senecal and Raymond M. Sadow (USAF, Systems Command, Aeronautical Systems Div., Dyna-Soar System Program, Wright-Patterson AFB, Dayton, Ohio).
Aerospace Management, vol. 5, Dec. 1962, p. 18-23.

General discussion of the advantages of Program Evaluation and Technical Review (PERT) as a valid management technique in the Dyna-Soar program.

A63-11520
A SOLUTION TO SOME PROBLEMS IN THE PLANNING AND CONTROL OF FIRST ARTICLE COSTS AND SCHEDULES.
Ross Williams (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Polaris Missile System Div., Sunnyvale, Calif.)
Society of Automotive Engineers, National Aerospace Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 8-12, 1962, Preprint 576A. 7 p.

Discussion of the planning and control problems associated with the predesign and the detailed design phases of a weapons-system program. Four problem areas are identified as follows: (1) lack of valid planning data, (2) improper role played by first-line supervisors in the planning and control process, (3) lack of data continuity between top management and first-line supervisor, and (4) oversophistication of techniques. A planning and control technique is described which offers solutions to these problems by providing some planning data in the form of work unit estimates for use in determining work-load requirements in key functions. A planning process, in which the detailed program plans are jointly prepared by the first-line supervisors, and a work-breakdown concept, which reflects the actual work effort in a program, are suggested. A list-type planning and control report to be used as an intermediate link between top-management reports and the planning and control devices used by first-line supervisors, is proposed. Additional customer and industry problems are briefly reviewed in an appendix, including kinds of programs (study contracts, research and development, and production contracts), kinds of contracts (cost-plus-fixed-fee, cost-plus-incentive-fee, and fixed-price), and the respective roles of government and industry.

A63-12402
PERT IN PERSPECTIVE.
Charles W. Getz.
Society of Automotive Engineers, National Farm, Construction and Industrial Machinery Meeting, Milwaukee, Wis., Sept. 10-13, 1962, Paper 557A. 20 p.

Discussion of network methods as applied to the USAF Program Evaluation and Review Techniques (PERT). Basically, PERT is a tool of management in its efforts to plan, schedule, and control production. Use of PERT by the Air Force in weapon system management is discussed in its various phases. Means of developing uniformity in the use of PERT when establishing costs for activities are outlined. An extensive bibliography on PERT and other networking procedures is included.

A63-13075
MANAGEMENT IN THE SPACE AGE.
Fremont E. Kast and James E. Rosenzweig (University of Washington, College of Business Administration, Seattle, Wash.)
New York, Exposition Press, Inc., 1962. 183 p.
$5.00.

Study of management in advanced technology industries. The weapon systems management concept is traced as an example of the type of project management that will be necessary in the space age. Following a discussion of the evolution of the concept, data are given on its impact on the military (including procurement patterns), on industry as a whole, and on the individual company.

A63-13078
OPERATIONS RESEARCH IN PRODUCTION AND INVENTORY CONTROL.
Fred Hanssmann (International Business Machines Corp., Dayton, Ohio).
New York, John Wiley and Sons, Inc., 1962. 254 p.
$8.95.

Survey of advances in inventory management, with emphasis on problem solving and specific applications. The book was developed from the material in a graduate course taught by the author at Case Institute of Technology. Areas discussed include single station (static deterministic models, static probabilistic models, and dynamic models), parallel stations, and series of stations.

A63-13246
A METHODOLOGY FOR SYSTEMS ENGINEERING.
Arthur D. Hall (Bell Telephone Laboratories, Inc., Murray Hill, N. J.)
Princeton, N. J., D. Van Nostrand Co., Inc., 1962. 478 p.
$12.00.

A treatment of the methodology of systems engineering is presented to increase awareness and understanding of the process, and to sharpen definitions and approaches to the principal recurring problems, such as definition, goal setting, systems synthesis and analysis, and choosing among alternate systems. Intended for teachers and students of systems engineering, creative engineering design, operations research, management science, and related fields, the material is presented in four groups: (1) description and analysis of the overall process, with identification and discussion of recurring problems; (2) problem definition and development of systems requirements; (3) decision-making, emphasizing problems of setting objectives, and designing effective value systems; and (4) approaches and tools useful in systems synthesis and analysis. Terms that are considered necessary for the logical development of systems engineering are listed in the index.

A63-13822
THE MANAGEMENT OF QUALITY CONTROL AND RELIABILITY.
Denver T. Johnstone, Jr. (Sperry Rand Corp., Vickers Inc., Aerospace Div., Torrance, Calif.)
Machine Design, vol. 35, Mar. 14, 1963, p. 132-138.

Examination of the special organizational and procedural problems created by the increased importance of product reliability. The following are considered: (1) quality control, which is an organized method of surveillance, measurement, and corrective action to assure that a manufacturing process conforms to accepted procedures; (2) reliability concepts, defined as the probability that a system or equipment will perform a required function under specified conditions, without failure, for a specified period of time; (3) management policies and procedures; (4) subcontractors' organization; (5) variation in requirements from one customer to the next; (6) marketing; and (7) the need for proper indoctrination of employees at all levels of organization.

A63-13885
HUMAN INTERACTIONS IN MAN-MACHINE SYSTEMS.
Alvyn M. Freed (Aerojet-General Corp., Reliability Div., Sacramento, Calif.)
Human Factors, vol. 4, Dec. 1962, p. 389-396. 19 refs.

Presentation of a theoretical basis for providing lists of human interactions in man-machine systems. Methods of defining, labeling, and measuring such interactions are suggested as basic to design input. Methods for isolating units of interactive behavior are proposed. Samples of system behavior and their respective activities are described in terms of actions and reactions. The need for definition and labeling of activities couched in operational terms is emphasized in the interest of design, training, and measurement of human interactions. Techniques for accomplishing these steps are suggested.

A63-15123

COST-EFFECTIVENESS EVALUATION FOR MIXES OF NAVAL AIR WEAPONS SYSTEMS.

Bernard S. Albert (North American Aviation, Inc., Columbus Div., Columbus, Ohio).

Operations Research, vol. 11, Mar.-Apr. 1963, p. 173-189; Addendum, George P. Jones, p. 189-193.

Contract No. NOa(s) 59-6074c.

Formulation of a weapons system cost methodology, specifically tailored to Navy operating characteristics, and development of an effectiveness evaluation procedure by way of linear programming to include the various restrictions cited. A method is described which employs iterative linear programming to solve the effectiveness optimization problem, for what is basically a nonlinear program. A second part of the methodology is a sensitivity test based on total direct weapons system cost which determines the minimum for any given effectiveness level.

A63-16680

PLANNING FOR TECHNOLOGY.

Warren G. Magnuson (U.S. Senate, Washington, D.C.)

(National Advanced-Technology Management Conference, Proceedings, Seattle, Wash., Sept. 4-7, 1962.)

IN: Science, Technology, and Management. New York, McGraw-Hill Book Co., Inc., 1963, p. 8-10.

Keynote address emphasizing the growing complexity and confusion of technology. A plea is made for more understanding of science and technology on the part of statesmen and politicians. Cooperation among scientists, engineers, and managers is stressed, but the scientists themselves are urged to learn to manage technology in its applications.

A63-16579

SCIENCE, TECHNOLOGY, AND MANAGEMENT.

Edited by Fremont E. Kast and James E. Rosenzweig (University of Washington, College of Business Administration, Seattle, Wash.)

(National Advanced-Technology Management Conference, Proceedings, Seattle, Wash., Sept. 4-7, 1962.)

New York, McGraw-Hill Book Co., Inc., 1963. 379 p. $7.95.

Compilation of discussion on problems of managing very large and complex advanced-technology programs, from their inception to the operation of the end products. These programs have a number of special characteristics which create unique managerial problems: (1) span of time which elapses from perception of need to final use; (2) pressure to use the latest technological developments; (3) accelerating developments and inventions to fit the needs of the programs; (4) long-term planning on the basis of incomplete information; (5) coordination of effort of various governmental branches and industry; and (6) ability to modify plans and designs as unexpected technical difficulties or innovations arise. These problems are analyzed, the progress that has been made to date is shown, and the areas that require further improvement are outlined. A number of the nation's most publicized and important advanced-technology programs are described and analyzed. These programs are discussed by those most intimately acquainted with them - the managers and/or scientists on the projects. This feature gives the reader an unusual opportunity to analyze problems relating to a large number of these programs and to see how science and technology are integrated through management. Discussed are ballistic missile programs, the Navy's Polaris program, the worldwide Mercury communications network, and the program for manned flight to the Moon. An attempt is made to develop a science of management applicable to future programs in which managerial ingenuity will be taxed to the utmost. It is suggested that this information will be of vital importance for those who are confronted with these problems and who must suggest solutions.

A63-18351

MINUTEMAN COST-CUTTING AIMS OUTLINED.

Robert Twiss.

Missiles and Rockets, vol. 12, June 24, 1963, p. 40, 42, 43.

Discussion of proposed means of effecting a $60 million cut in the 1964 expenditures on the Minuteman program. A cost-reduction program has been set up. Savings accomplished in fiscal 1963 include nearly $200,000 realized by remodeling vacant barracks at one Minuteman wing site instead of building units similar to those used where housing is unavailable.

A63-16893

SYSTEMS PHILOSOPHY.

David O. Ellis (Litton Industries, Inc., Research and Analysis Dept., Beverly Hills, Calif.) and Fred J. Ludwig (Litton Industries Inc., Guidance and Control Systems Div., Beverly Hills, Calif.)

Englewood Cliffs, N.J., Prentice-Hall, Inc., 1962. 387 p. $13.00.

Detailed discussion of the overall view of major concepts involved in the engineering and management of man-made systems and man/machine systems, treating systems technology as it exists and interpreting the probable trends and implied conclusions of current practice. The text is designed for both management and the public, and also furnishes a general survey of the subject for the scientific generalist and the specialist. Specifically covered are (a) basic system concepts, including subsystems and components, and selection and effectiveness criteria; (b) special problem areas, including human subsystems; (c) design and analysis; (d) the operational approach; and (e) a systems technology forecast for the next era. Technical detail is, for the most part, confined to the appendices which constitute the bulk of the book, and are completely independent, providing supportive and illustrative material for the text. Included in the appendices are (1) a precise definition of systems; (2) the notion of generalized logical design; (3) the partial design of a hypothetical weapons system; (4) the systems matrix approach; (5) a mathematical model of a conventional digital integrator; (6) a discussion of generalized logic; (7) preliminary consideration of an army surveillance system; (8) remarks on low-level redundancy; (9) elements of a behavioral theory of static decisions; (10) the relativistic Doppler effect, a new approach to space navigation; (11) limitations of contemporary terrestrial Doppler navigation radars; (12) the tunnel display concept; and (13) application of electromyographic techniques in the integration of man/machine systems.

A63-18026

THE IMPACT OF NEW PATTERNS IN MANAGEMENT.

Philip Geddes.

Aerospace Management, vol. 6, May 1963, p. 12-17.

Brief consideration of the new project-management approach used by General Dynamics/Astronautics. The important consideration in project management is to provide a viable functional group which can support the projects, but only as the project managers demand it. In this connection, the functional departments act as service agencies to the projects, which is the reversal of roles in the industry. Reasons for the failure of the Centaur project are briefly discussed.

A63-18027

HOW AVCO PUT MOST IN THE MINUTEMAN.

A. Iannone (Avco Corp., Lycoming Div., Stratford, Conn.)

Aerospace Management, vol. 6, May 1963, p. 21-23.

Consideration of the Management Operational System Technique (MOST), which has been used successfully throughout the nearly completed development program of the Minuteman Mark II. Disadvantages of PERT for smaller, less complex programs are noted. In addition to minimizing the need for computer runs, MOST saves time in computation, reduces manpower requirements, and increases the usability of information. A typical MOST network is schematically diagramed.

A63-18028

WHAT WENT WRONG WITH ADVENT.

John P. Kushnerick.

Aerospace Management, vol. 6, May 1963, p. 26-29.

Discussion of the reasons for the failure of Advent from the point of view of management control. The history of the project as its control was broadened and changed is briefly reviewed. Causes of failure are discussed in terms of scheduling, economics, management arrangement (which empasizes the overly-complicated interface), and PERT. Experience gained from Advent is briefly considered.

A63-18271

MANAGEMENT OF AN INDEPENDENT LABORATORY.

Alan E. Surosky (General Testing Labs., Moonachie, N.J.).

IN: Institute of Environmental Sciences, 1963 Annual Technical Meeting, Proceedings. Mt. Prospect, Ill., Institute of Environmental Sciences, 1963, p. 95, 96.

Analysis of the problems of managing an independent laboratory in terms of personnel, equipment, scheduling, and establishing of priorities, sales, and economic operation. The differences in operation between an independent laboratory and a government or company laboratory are discussed.

A63-18441
POLARIS OPERATIONAL EXPERIENCE.
Nathan B. Chase, Jr. (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Patrick AFB, Fla.).
American Institute of Aeronautics and Astronautics, Summer Meeting, Los Angeles, Calif., June 17-20, 1963, Paper 63-175. 7 p.
Members, $0.50; nonmembers, $1.00.

Consideration of the factors contributing to the overall success of the Polaris program, emphasizing the test base organization and operation. Discussed are the advantages gained from (1) single-point control; (2) monitoring schedule progress closely enough to ensure rapid corrective management action, including the Daily Status Meeting and a Daily Status Report; and (3) keeping the organization relatively lean and hard. The team concept of Polaris is discussed, according to which the people who perform the actual work on the hardware are organized into distinct, separate missile teams. The relationship to the development customer is also considered.

A63-20364
CROSSED WIRES IN INTERDISCIPLINARY SIMULATION STUDIES.
John D. Vandenberg and Sherman N. Mullin (Lockheed Electronics Co., Plainfield, N.J.).
IN: AIAA Simulation for Aerospace Flight Conference. Columbus, Ohio, Aug. 26-28, 1963. New York, American Institute of Aeronautics and Astronautics, 1963, p. 96-100.

Discussion of how the nontechnical factors, not unique to a single discipline, may influence the course of simulation studies conducted to develop quantitative and comprehensive specifications for man-machine systems within a time and cost schedule that is beneficial to the overall project. Some of the more prominent nontechnical factors affecting simulation studies are monetary, competitive, personality, and schedule considerations. Another difficulty in conducting interdisciplinary simulation studies arises from a failure of disciplines to recognize that the type of control exerted varies as a function of the study phase. Possible solutions to such difficulties are suggested.

A63-20760
OPERATIONAL SYSTEMS - A CURRENT COMPUTER TREND.
Robert E. Clement (IBM Corp., Data Processing Division, White Plains, N.Y.).
Electronic Industries, vol. 22, June 1963, p. K7-K9, K23.

Brief review of some industrial applications of computers. The use of computers for aerospace system simulation, such as the Marshall Space Flight Center's computer simulation of Saturn rockets, and data retrieval are noted, as is their use in operational systems for industrial applications. An example of such an application is the Inventory Management Program and Control Techniques (IMPACT), which is made up of three basic functions stored within the computer: ordering, forecasting and reviewing.

A63-23238
MANAGEMENT CONTROL AND MONITORING TECHNIQUES.
J. T. Molieri (RCA, Defense Electronic Products, Aerospace Communications and Controls Division, Camden, N.J.).
(Institute of Electrical and Electronics Engineers, International Conference and Exhibit on Aerospace Support, Washington, D.C., Aug. 4-9, 1963.)
IEEE Transactions on Aerospace, vol. AS-1, Aug. 1963, p. 251-259.

Discussion of management control and monitoring techniques in terms of policy determination and operation philosophy. Application of these techniques is a self-imposed discipline that extends to all activities in the Engineering Department in a uniform manner and ensures proper "control awareness" by engineers and engineering supervision. A significant feature of the technique is the ready availability of data on performance of time, cost, and technical accomplishments on a recurring basis for all programs.

A63-23258
RELIABILITY PROJECT COORDINATOR - AN EXTENSION OF THE MANAGEMENT FUNCTION.
Duane V. Olinger (North American Aviation, Inc., Autonetics Division, Computers and Data Systems, Downey, Calif.).
(Institute of Electrical and Electronics Engineers, International Conference and Exhibit on Aerospace Support, Washington, D.C., Aug. 4-9, 1963.)
IEEE Transactions on Aerospace, vol. AS-1, Aug. 1963, p. 446-454.

Discussion of reliability project coordination and its responsibility to management and to administration. Duties of a project coordinator are enumerated and flight control group responsibilities, as they relate to the realization of the tasks, are discussed. Included in a discussion of group responsibilities are an examination of failure recurrence prevention programs, design review, assessment of circuit operation, statistical analysis, logistic support, and formal reporting.

A63-23311
INTERFACES BETWEEN RELIABILITY AND VALUE ANALYSIS.
Robert L. Bidwell (Martin Marietta Corp., Martin Co., Value Analysis Administration, Baltimore, Md.).
(Institute of Electrical and Electronics Engineers, International Conference and Exhibit on Aerospace Support, Washington, D.C., Aug. 4-9, 1963.)
IEEE Transactions on Aerospace, vol. AS-1, Aug. 1963, p. 961-963.

Brief discussion of the increasing costs incurred in manufacturing and maintaining military material. Also considered is the use of value and reliability engineering as methods available to management to help reduce the problems. An example is cited of the Bullpup missile RF cavity, which shows the value of both the value engineer and the reliability engineer.

A63-26012
THE PROGRESS FUNCTION IN THE AEROSPACE INDUSTRY - A HISTORICAL ANALYSIS.
Robert P. Zieke (Aerospace Corp., San Bernardino, Calif.).
IEEE Transactions on Engineering Management, vol. EM-10, June 1963, p. 74-86. 109 refs.

Study of the development and use of the progress function by aerospace companies. The progress function is a predictive model developed by the airframe industry in the 1930's. It is also called the "improvement curve" or the "learning curve." It reflects the relationship between gross production output and the effect required to produce each unit of production. The history of these curves in the airframe industry is reviewed. Modifications of the basic functions are examined. Seven major uses of progress curves by the aerospace industry are in (1) cost estimates, (2) scheduling, (3) efficiency comparisons, (4) procurement and subcontracting, (5) facilities planning, (6) personnel planning, and (7) long-range planning. An evaluation is made of current usage.

N63-10094 Republic Aviation Corp., Farmingdale, N.Y.
A STUDY OF THE AIR FORCE MAINTENANCE TECHNICAL DATA SYSTEM [Final Report]
J. W. Losee, R. H. Allen, J. W. Stroud, and J. Ver Hulst Wright-Patterson AFB, Ohio, Behavioral Sciences Lab., Aug. 1962 199 p 5 refs
(Contract AF 33(616)-8193)
(AMRL-TDR-62-85) OTS: $5.00

This report details the research on preparation, production, distribution, evaluation, and verification of Air Force maintenance technical data. It highlights the impact of management on the procurement of accurate, timely, and economical data and identifies the areas in which management was found to be deficient. It points out the specific shortcomings in the data, in its preparation, distribution, and use. Finally, the report recommends actions considered necessary to first, improve the overall technical order system of management, and second, to enhance the quality, usefulness, and timeliness of the data produced. Author

N63-11596 Joint Publications Research Service, Washington, D.C.
SOME TRENDS IN THE STUDY OF "MAN-MACHINE" SYSTEMS IN THE UNITED STATES
M. I. Bobneva Transl. from Voprosy Psikhologii (Moscow), no. 3, 1962 p 177-184 Material from a conf. of the western div. of the Am. Inst. of Radio Engr., August 1960 *in its* Translations from Voprosy Psikhologii (Problems of Psychology) Nov. 29, 1962 p 76-87 18 refs (See N63-11593 04-14) OTS: $8.10

This paper on "man-machine" systems covers the following: methods of analysis of man-machine systems; criteria for distribution of functions between man and machine; simulation of the man-machine system; analysis of interaction of the system components; and symbolic coding of information. J.R.C.

N63-12833 General Electric Co. Technical Military Planning Operation, Santa Barbara, Calif.
COST-BENEFIT ANALYSIS AS AN AID TO SYSTEM SELECTION
Harry P. Hatry [1962] 29 p 16 refs Presentation at the General Electric Systems Engineering Symp., Schenectady, N.Y., Nov. 15, 1962 (SP-201)

A method of analyzing systems is presented as an aid in the selection of a system to perform some given mission. The method considers both the cost and effectiveness criteria, jointly. The method is illustrated by the following missions: system to repair orbiting satellites; weather and reconnaissance satellites; tactical bombing aircraft; and nuclear detection system. R.C.M.

N63-13737 Northwestern Technological Inst., Evanston, Ill.
MANAGEMENT SCIENCE AND MANAGING
A. Charnes and W. W. Cooper Mar. 1962 27 p 23 refs
(Contracts Nonr-1228(10) and Nonr-760(01))
(ONR Res. Memo-53)

The history of management is reviewed to point out the current status of management science and some of the possible future developments in management. The areas covered include: contribution to management by military leaders; management engineering; management concepts of Charles Babbage; current developments in methodology; and social and managerial implications for the future. R.C.M.

N63-15733 RAND Corp., Santa Monica, Calif.
NETWORK-TYPE MANAGEMENT CONTROL SYSTEMS BIBLIOGRAPHY
B. L. Fry Feb. 1963 204 p 417 refs
(Contract AF 49(638)-700; Proj. RAND)
(RM-3074-PR)

This bibliography contains listings of documents indexed by title and author and covering the literature on network-type management control systems. R.C.M.

N63-15702 RAND Corp., Santa Monica, Calif.
USES OF MONTE CARLO IN PERT
Richard Van Slyke Feb. 1963 28 p 9 refs
(Contract AF 49(638)-700; Proj. RAND)
(RM-3367-PR)

The mathematical assumptions underlying the PERT (Program Evaluation and Review Technique) management system are of doubtful validity, and, even granting these assumptions, there are still serious computational difficulties involved in getting the desired answers. This report outlines some of the weaknesses of the present system, and suggests how the use of Monte Carlo methods can lead to improvement, first in allowing less restrictive mathematical assumptions to be made, and second in extending the kinds of computational results that can be obtained. Moreover, the method can be used to check the validity of the commonly used approximations. A "criticality index" for an activity is defined: it is the probability that an activity will lie on a critical path. This is an example of a quantity that can be calculated by Monte Carlo methods, but not by presently used methods. An experimental computer program for Monte Carlo treatment of PERT networks has been coded for the IBM-7090 computer. The program is discussed, and some shortcuts are suggested for reducing the time of computation. Author

N63-18286 Bolt, Beranek, and Newman, Cambridge, Mass.
ADAPTIVE CHARACTERISTICS OF MANUAL TRACKING
Laurence R. Young, David M. Green, Jerome I. Elkind, and Jennifer A. Kelly [1963] 22 p 4 refs Presented at the 4th Natl. Symp. on Human Factors in Electronics, Men, Machines and Systems, Washington, D.C., May 2-3, 1963
(NASA Contract NASw-185)
(NASA CR-50297) OTS: $2.60 ph, $0.86 mf

The ensemble average technique, applied to the error signal following changes in control-system characteristics, appears to give a relatively clear picture of the process of adaptation. It also identifies the approximate times required for the human operator to adapt to a control change and to complete his adjustment to this change. The average error curves of Part III indicate that for the very simple situation under investigation, the adaptation times are on the order of 0.5 to 1.0 sec. Once having adapted, or taken on the correct strategy to go with the new control-system mode, the subject requires only an additional 0.3 sec or so to complete his adjustment to the new control mode. This is merely one basic movement time or sampling period if one considers a sampled-data model for the human operator. It must be emphasized that the results shown in Part III are preliminary results only, taken on one subject with a simple position control in the compensatory mode. The ensemble average technique does, however, appear to be a useful tool for investigating the adaptation process, which otherwise defies both sophisticated and simple-minded analysis techniques. Author

N63-19347 RAND Corp., Santa Monica, Calif.
A BRIEF REVIEW OF SIMSCRIPT AS A SIMULATING TECHNIQUE
M. A. Geisler and H. M. Markowitz Aug. 1963 27 p 3 refs
(Contract AF 49(638)-700; Proj. RAND)
(RM-3778-PR)

The underlying concepts, structure, and current status of SIMSCRIPT are reviewed. SIMSCRIPT is a way of designing and writing down a simulation model, and has been developed with the following objectives: (1) to produce a generalized structure for designing simulation models; (2) to provide a rapid way of converting a simulation model into a computer program; (3) to provide a rapid way of making changes in the simulation model which can be readily reflected in the machine program; and (4) to provide a flexible way of obtaining useful outputs for analysis. The method is not only an abridged language, but also a structure with the help of which a wide class of management problems can be programed to a computer. It is so designed that whole areas of a problem can be changed without reprograming the entire model. SIMSCRIPT streamlines programing and makes it faster and more economical to use. N.E.A.

N63-20021 College of Aeronautics, Cranfield (Gt. Brit.)
STATISTICAL PARAMETERS IN PLANNING AERO-ENGINE PRODUCTION
A. H. Atkinson and J. T. Harris Feb. 1963 37 p 43 refs
(CoA-158)

The build-up time to the planned peak rate of production in a particular situation is found to be about eighteen months but with variation between firms. The reduction in operator-performance time, which occurs with repetition during the build-up period and afterwards, is discovered to be present in machining as well as assembly, but to a lesser extent. The logarithmic function generally descriptive of such a tendency is found to fit the actual man-hour content values rather than the cumulative average ones. The relationship between the logistic of output and the logarithmic function is established and used to estimate labor requirements from the commencement of production onwards. In addition to the above consideration of production variables, examples are given of the use of engine-performance ratings to estimate costs. Because of the importance of planning to productivity, a typical production program has been included. Author

N63-21151 Bellcomm, Inc., Washington, D.C.
SYSTEMS ENGINEERING
John A. Hornbeck and Julian M. West *In* NASA, Washington, D.C. Proc. of the Conf. on Space-Age Planning, Chicago, May 6-9, 1963 p 235-237 (See N63-21126 21-01)

Systems engineering is a management tool created specifically to improve the technical management of large development programs. The functions and responsibilities of systems engineering for the Apollo project are as follows: (1) definition of the overall system requirements (including nominal mission capability); (2) definition of the nominal mission profile; (3) development of the primary Apollo system specification; (4) definition of the overall system test plan; and (5) definition of the overall reliability and quality control program. I.v.L.

N63-21952 National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Tex.

PROJECT REVIEW

Walter C. Williams, Kenneth S. Kleinknecht, William M. Bland, Jr., and James E. Bost *In its* Mercury Proj. Summary Including Results of the 4th Manned Orbital Flight, May 15-16, 1963 p 1-31 12 refs (See N63-21951 22-01)

Directing the Mercury moving project required the development of a management structure and operating mode that satisfied the requirement to mold the many different entities into a workable structure. The management methods and techniques so developed are discussed. Other facets of the Mercury experience such as techniques and philosophies developed to ensure well-trained flight and ground crews and correctly prepared space vehicles are discussed. Also, those technical areas of general application to aerospace activities that presented obstacles to the accomplishment of the project are briefly discussed. Emphasis is placed on the need for improved detail design guidelines and philosophy, complete and appropriate hardware qualification programs, more rigorous standards, accurate and detailed test procedures, and more responsive configuration control techniques. Author

A64-11342

MANAGEMENT CONCEPTS IN FLIGHT TEST AND CERTIFICATION OF THE DC-9.

J. P. Hann (Douglas Aircraft Co., Aircraft Div., Long Beach, Calif.).

IN: TESTING OF MANNED FLIGHT SYSTEMS CONFERENCE, EDWARDS AFB, CALIF., DECEMBER 4-6, 1963, PROCEEDINGS. Conference sponsored by the American Institute of Aeronautics and Astronautics, Air Force Flight Test Center, and NASA, Flight Research Center.

New York, American Institute of Aeronautics and Astronautics, 1963, p. 82-85.

Brief discussion of the DC-9 flight-test program management, which is organized on a project basis. All functions associated with the DC-9 are directly responsible to the program manager. The program office monitors the status of such parameters as costs, performance, and schedules, by using PERT and modern cost accounting procedures. DC-9 design objectives are outlined. A procedure of engineering personnel interchange, which was established to co-ordinate flight test and design is described.

A64-11343

PLANNET - A TECHNIQUE FOR APPLICATION TO TEST RANGE MANAGEMENT.

Nathan H. Ranck and H. H. Pfeiffer (Pan American World Airways, Guided Missile Range Div., Patrick AFB, Fla.).

IN: TESTING OF MANNED FLIGHT SYSTEMS CONFERENCE, EDWARDS AFB, CALIF., DECEMBER 4-6, 1963, PROCEEDINGS. Conference sponsored by the American Institute of Aeronautics and Astronautics, Air Force Flight Test Center, and NASA, Flight Research Center.

New York, American Institute of Aeronautics and Astronautics, 1963, p. 86-93.

Description of a management control technique entitled PLANNET (planning network) for the planning, scheduling, and execution of development projects, especially of the Atlantic Missile Range. The basic concepts, definitions, and orientation of the program, which is a graphic representation of a work effort (or series of work efforts) displayed on a time-scaled grid, are outlined. The data collection and reduction techniques used in constructing a PLANNET are described. PLANNET is able to tell program activity, responsibility, activity relationship, critical path of a network, simulation conditions, and resource re-allocation. The compatibility between PLANNET and PERT (Program Evaluation and Review Technique) is discussed.

A64-11643

STEEP - THE SYSTEM TEST AND EVALUATION EXPEDITING PROCEDURE.

James H. Walker (USAF, Missile Test Center, Patrick AFB, Fla.), Edmund A. Wright, Jr. (USAF, Directorate of Armament Development, Eglin AFB, Fla.), and Waino W. Suojanen (Florida State University, Research and Development Management Program, Eglin AFB, Fla.).

Air University Review, vol. 14, Sept.-Oct. 1963, p. 99-105.

Discussion of the principles involved in STEEP, which divides system testing and evaluation into three categories. Category I test programs are conducted by the contractor, Category II testing is performed by the AF Systems Command, and Category III test programs are conducted by the using command. Considered are STEEP test and evaluation philosophy, demonstration criteria and evaluation methods, test procedures and controls, and weapon system management.

A64-14480

INTRODUCTION TO CYCLIC REPLACEMENT SYSTEMS.

B. B. Winter (North American Aviation, Inc., Autonetics Div., Anaheim, Calif.).

IEEE Transactions on Reliability, vol. R-12, Dec. 1963, p. 36-49. 7 refs.

Presentation of a fundamental and unified treatment of problems similar to the classical Swedish Machine Problem. Description of the nature of the systems known as cyclic replacement systems is given. Basic definitions and results used for pertinent facts about Markov processes are gathered. It is shown that a certain class of cyclic systems behaves as homogeneous Markov processes. Considered is a homogeneous process with denumerable state space (represented by non-negative integers) called a homogeneous birth and death process. The application of birth and death processes to some cyclic replacement systems is discussed. Some systems which cannot be represented as birth and death processes are also treated.

A64-14704

PROGRAM MANAGEMENT TECHNIQUES AT MARTIN ORLANDO.

Leander Schaidt (Martin Marietta Corp., Martin Co., Air-to-Surface Missile Systems, Orlando, Fla.).

(Institute of Electrical and Electronics Engineers, National Winter Convention on Military Electronics, Los Angeles, Calif., Jan. 31, 1963.)

IEEE Transactions on Engineering Management, vol. EM-10, Sept. 1963, p. 124-137.

Description of the concepts and systems of program management and project control used at Martin-Orlando. The functions of each level of management are described. A project master plan is presented which summarizes major items of work and delivery status. The plan is color-coded to indicate firm business under control, carry on business expected against existing contracts, and potential business expected as a result of research and development and sales. Also presented is a missile flow plan which shows the sequence of completion of subassemblies and components, process flow through final assembly, and the required scheduling and time spans. Input-output control curves are discussed.

A64-14705

PROJECT COST CONTROL AT RAYTHEON'S WAYLAND LABORATORY.

E. L. Williams and G. A. Wilson (Raytheon Co., Surface Radar and Navigation Operation, Equipment Div., Wayland, Mass.).

IEEE Transactions on Engineering Management, vol. EM-10, Sept. 1963, p. 138-149.

Description of the development and implementation of the Project Cost Control system, to assist those who wish to install such a system in their organizations. Included in the discussion are: (1) the definitions of responsibility and authority required to make the system work; (2) the roles and interrelationships of the controller, line management, and project management; (3) the requirement for, and methods of, dividing projects into manageable pieces both in terms of size and of time; (4) the paperwork required for documentation of data inputs and outputs; and (5) the interpretation of reports in terms of project, organization, and individual performance.

A64-14706

SELECTED REFERENCES ON PERT AND RELATED TECHNIQUES.

B. L. Fry (North American Aviation, Inc., Atomics International Div., Management Systems and Evaluation, Canoga Park, Calif.).

(RAND Corp., Memorandum RM-3074-PR, Feb. 1963.)

IEEE Transactions on Engineering Management, vol. EM-10, Sept. 1963, p. 150, 151.

Bibliography of 50 items selected to demonstrate the scope of material covered in studies of the network-type management control systems. The documents are organized by author, title, author's organization, chronology, and a file number. The bibliography comprises two listings, one indexed by author and one indexed by title.

A64-15227

AN ANALYTICAL STUDY OF THE PERT ASSUMPTIONS.

Kenneth R. MacCrimmon (Carnegie Institute of Technology, Pittsburgh, Pa.) and Charles A. Ryavec (Michigan, University, Ann Arbor, Mich.).

Operations Research, vol. 12, Jan.-Feb. 1964, p. 16-37. 6 refs.

USAF-sponsored research.

Presentation of the results of a mathematical analysis of the standard assumptions used in PERT calculations. The objectives of this analysis were four-fold: (1) to pull together the mathematical aspects of the PERT model, (2) to suggest relevant analytic techniques, (3) to obtain an indication of the magnitude and direction of errors introduced by the assumptions, and (4) to suggest possible modifications and improvements in the model. Analyzed first are those assumptions which are relevant to the individual activities. Three possible sources of error are considered here: (1) the beta distribution assumption, (2) the standard deviation assumption and the approximation formula for the mean, and (3) the imprecise time estimates. Then, the PERT network as a whole is considered and the calculations underlying the project mean, standard deviation, and probability statements are analyzed. The concept of relative criticalness is explored for the PERT stochastic model. Techniques for network reduction are outlined.

A64-16010

ON-LINE MANAGEMENT INFORMATION. I - PLANNING A SYSTEM.

Norman J. Ream (Lockheed Aircraft Corp., Burbank, Calif.).

Datamation, vol. 10, Mar. 1964, p. 27-30. 5 refs.

Discussion of plans for a real-time management information system. A real-time management information system monitors the physical environment but exerts only indirect control by the production of management type reports or displays. The general instrumentation of simplex, duplex, master/slave, shared-file, and multiprocessing systems is briefly surveyed. A real-time system is used for obtaining planning, control, and operating reports and can also be used to develop by-product data for the production of new criteria for performance evaluation.

A64-16870

MANAGEMENT TECHNIQUES APPLICABLE TO SYSTEMS TEST PROGRAMS.

Jeremy A. Lifsey (Burroughs Corp., Defense and Space Group, Paoli, Pa.).

IEEE Transactions on Engineering Management, vol. EM-10, Dec. 1963, p. 166-174.

Contracts No. AF 33(600)-40540; No. AF 33(657)-7583.

Presentation of the results of an application of basic management principles to the Airborne Long Range Input (ALRI) test program. The testing involved system integration of airborne electronic sensor and communication equipment with ground electronic data processing and computation equipment. The management of the test program coordinated the efforts of approximately ten industrial subcontractors to comply with requirements and procedures of the Air Force. The methods used to keep all personnel informed of the activities at the site, at the home office, and at the management meetings with the Air Force are discussed. Some of the techniques appear to be simple and obvious, but precisely because of this, they are usually overlooked. Experience has shown that the implementation of these techniques is effective in preventing troublesome situations. Other techniques discussed include the methods of data documentation, the maintenance of administrative records, which are generally regarded as an unnecessary evil and, hence, injudiciously avoided, and the arrangement of schedules to obtain maximum performance and minimal disruption of testing. A listing is provided of those techniques that were considered important in the hope that they will be of use to system managers looking forward to a similar test program.

A64-16049

PROVIDING TIMELY PRODUCTION DATA.

Robert D. Bernhard (Bell Helicopter Co., Data Processing Dept. Fort Worth, Tex.).

Automation, vol. 11, Mar. 1964, p. 48-55.

Description of a total information system designed to provide a company management with specific elements of information required for planning, execution, evaluation, and control of the total business - in this case, helicopters.

A64-16871

POED - A METHOD OF EVALUATING SYSTEM PERFORMANCE.

D. R. J. White, D. L. Scott, and R. N. Schulz (White Electromagnetics, Inc., Rockville, Md.).

IEEE Transactions on Engineering Management, vol. EM-10, Dec. 1963, p. 177-182.

Description of POED (Performance Organization for Evaluation and Decision) which is an evaluation and decision technique which permits computing performance of a device, equipment, system or system complex; compares and scores this performance against requirements or value judgments representing users' needs; and organizes results in a useful manner so that assessment of value is readily achieved. It is a basic ingredient for making decisions. POED permits comparing performance of dissimilar or competitive systems against several yardsticks representing different attributes of performance requirements. It also provides a means for determining sensitivity of a system to its constituents and for computing the confidence factor of results. Finally, POED provides a synthesis tool for optimizing systems in conceptual, design, operational, or retrofit stages.

A64-19985

LONG RANGE PLANNING FOR A MAJOR COMPONENT MANUFACTURER.

George P. Sutton (North American Aviation, Inc., Rocketdyne Div., Long Range Planning, Canoga Park, Calif.).

American Institute of Aeronautics and Astronautics, Annual Meeting, 1st, Washington, D.C., June 29-July 2, 1964, Paper 64-404. 7 p. Members, $0.50; nonmembers, $1.00.

Brief review of the major facets and principal premises of long-range planning activities as they are currently practiced at Rocketdyne. The topics considered include the two basic steps in long-range planning, evaluation of external influences, statement and re-examination of objectives, identification of new opportunities in rocket propulsion, major future programs and their selection, major areas of research and development, market and sales prediction, facilities plan, skills and personnel, dollar resources, the planning organization, and key premises. Figures show charts of the Rocket Division's total national market by product, national market, and product sales.

A64-20262

PACC - A SIGNIFICANT ADVANCE IN MANAGEMENT CONTROL.

Martin J. Crean and Joseph R. Muller (Sperry Rand Corp., Sperry Gyroscope Co., Great Neck, N.Y.).

American Institute of Aeronautics and Astronautics, Annual Meeting, 1st, Washington, D.C., June 29-July 2, 1964, Paper 64-411. 9 p. Members, $0.50; nonmembers, $1.00.

Discussion of the management control system used at the Sperry Gyroscope Company. Product Administration and Contract Control (PACC) is an integrated data processing system designed to provide management with the necessary tools for control of overall program operations. To achieve the objective of improved management control, PACC is designed to include both information and control subsystems as well as operating subsystems, for complete control of company activities.

A64-21607
PROGRAM CONTROL SYSTEMS.
John McNeil (Collins Radio Co., Cedar Rapids, Iowa).
IN: NATIONAL WINTER CONVENTION ON MILITARY ELECTRONICS, 5TH, LOS ANGELES, CALIF., FEB. 5-7, 1964, PROCEEDINGS. VOLUME 3.
Convention sponsored by the Professional Technical Group on Military Electronics, Institute of Electrical and Electronics Engineers.
Edited by R. F. Lander.
North Hollywood, Western Periodicals Co., 1964, p. 12-26 to 12-42. 14 refs.

Presentation of an approach to program control which is oriented to systems management.. Aspects of the problem considered include total program control, systems management, program control, introduction to PERT network activity pricing. PERT activity pricing and analysis in detail, use of expenditure rate curves in cost planning and control, frequency of cost reporting, technical performance and program schedules, and project status reporting.

A64-23230
REALITY AND DEVELOPMENT TEST SCHEDULES.
James S. Stewart (Northrop Corp., Nortronics Div., Palos Verdes Estates, Calif.).
IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, PHILADELPHIA, PA., APRIL 13-15, 1964, PROCEEDINGS.
Mt. Prospect, Ill., Institute of Environmental Sciences, 1964, p. 537-540.

Discussion showing that the increasing incidence of performance and reliability incentive clauses applied to development testing can cause major changes from present practice, and that these changes can be incompatible with the use of development tests as project milestones under incentive clauses, unless great care is exercised. A definition is presented of the task of the engineer which applies to both individuals and to engineering organizations, one which establishes the basic nature of the product of engineering and which is consistent with the properties of professionalism. These properties are then related to the design process, leading to a model of engineering with a clear, functional basis which can then be used for comparison of certain current practices, and of the requirements of incentive contracting.

A64-23238
LABORATORY MANAGEMENT.
Charles Cavalconte (Republic Aviation Corp., Power Conversion Div., Farmingdale, N. Y.).
IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, PHILADELPHIA, PA., APRIL 13-15, 1964, PROCEEDINGS.
Mt. Prospect, Ill., Institute of Environmental Sciences, 1964, p. 593-595.

Discussion of the meaning of the concepts of research, development, and test in terms of the activities of an industrial laboratory. The set of tasks which must be carried out regardless of the project served are considered. These tasks which support the laboratory activities are: technical assistance - engineering, activities concerning the equipment, technician assistance, maintenance, and activities concerning the facilities.

A64-23299
ANALYTICAL METHODS IN THE STUDY OF MAN-MACHINE SYSTEMS.
Barbour Lee Perry and H. P. Birmingham (U.S. Naval Research Laboratory, Washington, D. C.).
(Institute of Electrical and Electronics Engineers, International Convention, New York, N. Y., Mar. 23-26, 1964.)
IEEE International Convention Record, vol. 12, pt. 7, 1964, p. 220-225. 5 refs.

Discussion of some basic concepts of human factors engineering. "Human Factors" is an interdisciplinary effort oriented toward the achievement of maximally effective man-machine systems. This emerging science has particularly close ties to mathematics, electronics, physics, and experimental psychology. The application of analytical techniques to the study of man-machine systems is discussed. Also analyzed is the utility of the Laplacian concept in characterizing human behavior within systems.. The benefits of these approaches are evident in examples of the optimal design of vehicular control systems and in sophisticated approaches to the selection and training of operators.

A64-23322
ANALYTICAL TOOLS FOR MAINTAINABILITY AND SUPPORT SYSTEM EVALUATION.
Ronald A. Westland and Lennard B. Weingarten (Dunlap and Associates, Inc., Western Operations, Santa Monica, Calif.).
American Institute of Aeronautics and Astronautics, Transport Aircraft Design and Operations Meeting, Seattle, Wash., Aug. 10-12, 1964, Paper 64-636. 15 p. 8 refs.
Members, $0.50; nonmembers, $1.00.

Delineation of certain efforts to render tractable systems of an extremely complex nature and to put them into the framework of commercial transport system analysis. Probabilistic modeling techniques and systems effectiveness models are studied; equations are developed which use the following mean-time functions: between failures (MTBF), to restore (MTTR), to perform scheduled maintenance (MTSM), and between scheduled maintenance periods (MTBS). It appears that many complex systems can be evaluated by effecting a translation to the transport context with little or no basic change.

A64-23346
THE DETERMINANTS OF INVESTMENT VARIATIONS IN RESEARCH AND DEVELOPMENT.
Marshall Hall (Wisconsin, University, Dept. of Economics, Madison, Wis.).
IEEE Transactions on Engineering Management, vol. EM-11, Mar. 1964, p. 8-15. 13 refs.
Research supported by the University of Wisconsin.

Presentation and test of a model designed to explain the research and development investment decision of firms. An attempt is made to explain the role of certain variables after isolating other variables that are not specified in the model. Estimates are made of the departure from the desired level of research and development expenditure and the coefficients of important variables that cause deviations from the level. The main variables discussed are profits, sales changes, expected sales changes, and expected capacity changes. The statistical method used to estimate the parameters of the variables is multiple regression analysis. On the basis of the analysis, several hypotheses are proposed and discussed in relation to alternative hypotheses.

A64-23347
RESEARCH PROJECT SELECTION - TESTING A MODEL IN THE FIELD.
William H. Pound (Northwestern University, Technological Institute, Dept. of Industrial Engineering and Management Science, Evanston, Ill.).
IEEE Transactions on Engineering Management, vol. EM-11, Mar. 1964, p. 16-22. 7 refs.

Results of a field test of a procedure for evaluating research projects. The procedure, based on what is termed an expected-value model, considers the following decision elements: (1) the environment of the problem, (2) the decision maker, (3) his objectives, and (4) his alternatives. The decision maker's alternatives, in this case a number of potential research projects, are evaluated in the light of his objectives. The result of the procedure is a ranking of potential projects in terms of their expected values. This procedure was tested in a research laboratory by having four decision makers evaluate a selected list of research projects. The resulting ranking of the projects was found to agree with an intuitive evaluation by the decision makers of the same list of projects. This gives an indication that the expected-value model may be useful in the complex area of research project selection.

A64-23348
PROGRAM CONTROL SYSTEMS.
John F. McNeil (Gates Radio Co., Quincy, Ill.).
IEEE Transactions on Engineering Management, vol. EM-11, Mar. 1964, p. 29-42. 14 refs.

Description of an approach to program control oriented toward systems management. The following topics are discussed: total program control; systems management; program cost control; PERT network activity pricing; expenditure rate curves in cost planning and control; frequency of cost reporting; technical performance and program schedules; and project status reporting.

A64-24588

PLANNING FOR MANUFACTURE.

Robert Frechman (Republic Aviation Corp., Farmingdale, N.Y.) and D. C. Richardson (Douglas Aircraft Co., Inc., Santa Monica, Calif.).

IN: TOOLING FOR AIRCRAFT AND MISSILE MANUFACTURE. Edited by Frank W. Wilson and Walter R. Prange. New York, McGraw-Hill Book Co., 1964, p. 1-30.

Discussion of the factors involved in effective and economical planning. Because of the complexity and cost of aircraft and the necessity for quick deliveries, scheduling is a major problem. Research and development aspects and research and engineering tests are considered. Peak production is of short duration, and the quantity of units manufactured is small. Design changes are always necessary and must be anticipated. Processing and cost estimating must commence with approximations and finish with a high degree of accuracy. In estimating, the capacity of personnel to gain skill as the project continues, must be evaluated. Determination of tooling requirements is extensively treated, and pictorial representations of flow charts and production breakdowns are presented. Rates and schedules, tooling for high and low production, tool materials, and tool design standards are discussed.

A64-24845

THE USE OF MAN/MACHINE INTERACTION MODELS IN SHORTENING SYSTEM DEVELOPMENT CYCLES.

J. F. Brown, W. E. Feroglia, and R. A. Seitle (Philco Corp., Western Development Laboratories, Palo Alto, Calif.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 304-313.

Presentation of an approach to preliminary system design. It is felt that through the development of a versatile model to describe the system's man/machine interactions, the selection of a flexible display concept, and frequent information interchange between the hardware and analysis engineering groups, the information requirements analysis and the hardware design development phase can run concurrently. The procedure is illustrated by demonstrating its application in solving the problem of developing the display system design for NASA's Integrated Mission Control Center (IMCC).

A64-25180

VALUE ANALYSIS AS APPLIED TO A RESEARCH AND DEVELOPMENT PROGRAM.

J. W. Moon and J. G. Littlejohn (Ling-Temco-Vought, Inc., LTV Michigan Div., Warren, Mich.).

Journal of Value Engineering, vol. 2, Aug. 15, 1964, p. 9-12.

Presentation of methods. The value-analysis program is divided into four areas: (1) Goals. The desire is to provide a system to meet all requirements for the least overall cost; (2) Organization. A program management organization was applied to the system. A block diagram of the value analysis organization is given. A list of "firsts" is presented. The training program used is mentioned along with the LTVM value analysis study process system. (3) Accomplishments. (4) Future potentials.

A64-25181

IMPLEMENTING VALUE ENGINEERING DURING SYSTEM DESIGN AND DEVELOPMENT.

E. W. Dearborn (Boeing Co., Aerospace Div., Missile Branch, Seattle, Wash.).

Journal of Value Engineering, vol. 2, Aug. 15, 1964, p. 28, 29.

Discussion of methods. The task of value engineering is to determine a method of adjusting cost to a position of equality with mission and performance criteria. The phases of design development during research and development are mentioned. The general tasks for the research and development contractor in these phases are listed. The role of value engineering during weapons systems requirements analysis, preliminary design, and detailed design is discussed. Means by which the value engineering contribution can complement the design process during system-design development are given.

A64-25354

AN INTRODUCTION TO SYSTEMS ANALYSIS.

J. K. O'Keefe (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale; Santa Clara, University, Dept. of Mechanical Engineering, Santa Clara, Calif.).

Journal of Industrial Engineering, vol. 15, July-Aug. 1964, p. 163-167. 6 refs.

Discussion of the qualitative and quantitative aspects of systems analysis in terms of a step-by-step organization of the analysis effort. Concepts basic to the logical accomplishment of systems analysis in industrial engineering are examined in terms of external requirements, sectionalization, and internal systemization. Two examples are shown of conceptual tools believed to be most important: the design flow chart and the system network diagram. The systems analysis concepts advanced are believed to be applicable not only to the aerospace systems given as examples but also to other complex systems encountered in industrial engineering.

A64-25355

THE LEARNING CURVE - A CASE HISTORY IN ITS APPLICATION.

Julian L. Kottler (Avco Corp., Aerospace Structures Div., Nashville, Tenn.).

Journal of Industrial Engineering, vol. 15, July-Aug. 1964, p. 176-180. 5 refs.

Description with an applied case of the use of the learning-curve principle to forecast and control direct labor cost. The learning-curve theory is said to propose that as the total quantity of units doubles, the hours/unit (which reflect cost) decline at some constant percentage. Programs of motion and time study were reportedly used to establish standard methods and work crews. An analysis of direct labor cost and performance was made. Tables are presented giving the development of plot points for the direct labor learning curve, planned cost development, and actual cost vs planned cost.

A64-26794

INCREASING PRODUCTIVITY AT OCAMA.

I. R. Perkin (USAF, Oklahoma City Air Materiel Area, Oklahoma City, Okla.).

Air University Review, vol. 15, Sept.-Oct. 1964, p. 92-104.

Discussion of methods of reducing costs by increasing productivity, accomplished at the Oklahoma City Air Materiel Area (OCAMA) through inducing people to exert more effort, providing more effective tools and equipment, and developing better procedures and techniques. Among typical examples of the second method, one was the application of standard automatic circuit analyzers to circuit checking of the B-52 aircraft, resulting in repetitive annual savings of $800,000 against an equipment cost of $600,000. Intensive efforts are constantly made to utilize equipment which has been declared excess elsewhere, and some $3,000,000 worth of such property has been acquired and installed in OCAMA's shops. Some examples are heat-treat furnaces, a chromium-plating system, and a water deionizer. Numerical control (N/C) has made possible lower-cost machining, and five N/C machines are in use. Electrical discharge machines are used to work parts made of cobalt, tungsten, and titanium. The favorable results achieved by a major automobile manufacturer in improving quality without increasing cost are discussed in some detail. The importance of cleanliness is cited, with the comment that use of a "clean room" reduced a reject rate from 20% to 5%. Output per person has been increased in quantity and quality by awards programs and job-evaluation techniques. OCAMA has, by application of the methods described, achieved an average 4.2% increase in output per man-day without any lowering of quality standards. F. R. L.

N64-11872 Joint Publications Research Service, Washington, D.C.

MAN AND TECHNOLOGY (OUTLINES IN ENGINEERING PSYCHOLOGY)

Boris Fedorovich Lomov 16 Dec. 1963 311 p refs Transl. into ENGLISH of the book "Chelovek i tekhnika (Ocherk inzhenernoy psikhologii)" Leningrad, Leningrad Order of Lenin State U., 1963 p 1-265

(JPRS-22300; OTS-64-21030) OTS: $5.00

A general review of engineering psychology problems is presented. First, the general characteristics of man as a link in control systems, including the speed, precision, and reliability of human activity, is discussed. Four aspects of the reception and processing of information by man are considered: (1) the relationship of the physical properties of signals to the characteristics of sensitivity of the human sensory apparatus; (2) the selection of the physical form of signals addressed to man; (3) the characteristics of the volume of information which man may receive, store, and process; and (4) the psychic processes through which information is received. The practical problem of the design of indicators is considered, and the problem of motor (reflex) components of control activity is related to the design of control components. M.P.G.

N64-15903* Northwestern U., Evanston, Ill. Technological Inst.

PROGRAM OF RESEARCH ON THE MANAGEMENT OF RESEARCH AND DEVELOPMENT First Semi-Annual Status Report

Albert H. Rubenstein [1964] 9 p refs

(NASA Grant NsG-495)

(NASA CR-55660) OTS: $1.10 ph, $0.80 mf

Descriptions of and progress in the following studies are presented: (1) Idea Flow in Research and Development, (2) Organization of Research and Development in Decentralized Companies, (3) Organization of Applied Research in Developing Countries, (4) Research and Development Responses to Market Crises, (5) Sources of Research and Development Achievements in Electronics since 1945, (6) A Directory of Research-On-Research, (7) Costs of New Technical Skill Development in Research and Development, (8) Life Histories of Operations Research, (9) Analysis of Rates of Expenditure on Development Projects, and (10) Researchers' Needs for Information. R.T.K.

N64-16114* Aerospace Industries Assn. of America, Inc., Washington, D.C.

JOINT INDUSTRY-GOVERNMENT FORUM AND WORKSHOPS. THE AEROSPACE RELATIONSHIP, SEPTEMBER 16-17, 1963, WASHINGTON, D.C.

[1963] 54 p refs

Participants and records of proceedings for 12 workshops on mutual industry-government problems are given. Subjects covered are electronics, export, facilities, financial management, flight test, industrial security, product support and logistics, propulsion, spare parts, technical manuals, quality control/reliability, and traffic management. R.L.K.

N64-16667 Joint Publications Research Service, Washington, D.C.

ORGANIZATION OF WORK IN ENGINEERING PSYCHOLOGY IN THE USA

A. I. Nazarov 28 Feb. 1964 Transl. into ENGLISH of an article from Vopr. Psikhologii (Moscow), no. 5, 1963 p 176-186

(JPRS-23448; OTS-64-21682) OTS: $0.75

The aspects of engineering psychology discussed include: (1) scope and terminology; (2) trends; (3) basic stages in development; (4) problems in the organization of research; and (5) research conducted in various industrial firms in the USA. R.T.K.

N64-16799 Ohio State U., Columbus Lab. of Aviation Psychology

TERM EXPECTATION AND UNCERTAINTY IN HUMAN DECISION BEHAVIOR

Jerry D. Tate, William C. Howell and Karl L. Wiegand (Aerospace Med. Div.) Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs. (6570th), Nov. 1963 24 p refs

(Contract AF 33(616)-7122)

(AMRL-TDR-63-118; AD-431634) OTS: $0.75

This study was conducted to investigate the manner and degree to which a decision maker's sequence of decisions is influenced by objectives of varying remoteness (term expectation) and by informational uncertainty. The effects of these two variables on sequential decision performance were studied in a 4 × 4 factorial experiment. Decisions (predictions) were made either at prescribed uncertainty levels or on a freely chosen basis (depending on the prevailing experimental conditions), and a range of choices varying in degree of risk and payoff was available at each uncertainty level. The same five subjects served in all conditions of the experiment. Choices were evaluated in terms of risk, expected value, and average departure from linear progression to mean winning score (DFL). The DFL analysis suggested that factors more immediate than term expectation heavily influence decisions. Author

N64-16994 Library of Congress, Washington, D.C. Aerospace Information Div.

FUTURE TRENDS IN SOVIET SCIENCE AND TECHNOLOGY, REVIEW OF SOVIET-BLOC LITERATURE

7 Feb. 1963 286 p

(AID-P-63-2; AD-299103) OTS: $18.00 ph, $8.78 mf

This report is divided into the following parts: (1) general information; (2) astrophysics and space sciences; (3) atomic energy; (4) automation and computers; (5) biology; (6) earth sciences and meteorology; (7) electronics and electricity; (8) metallic materials; (9) nonmetallic materials; (10) physics; and (11) scientific administration, organization, and education. P.V.E.

N64-17012 Queen's U., Belfast (Northern Ireland)

THE CALCULATION OF SECOND ORDER DISTURBANCES *in its* Res. on Phys. of the Upper Atmosphere 30 Jun. 1963 p 45-58 refs (See N64-17002 09-23)

The method of Dalgarno for the calculation of dipole and quadrupole polarizabilities and shielding factors is developed for four-electron systems in the configuration $1s^2\ 2s^2$. Results are given for the systems Be, B+, and C++. Author

N64-17242 Joint Publications Research Service, Washington, D.C.

ESSAYS ON CYBERNETICS

Lev Pavlovich Teplov 6 Mar. 1964 482 p refs Transl. into ENGLISH of the book "Ocherki o Kibernetike" Moscow, "Moskovskiy rabochiy" Publishing House, 1963 415 p

(JPRS-23554, OTS-64-21728) OTS: $6.00

The topics discussed include the following: (1) cybernetics—its place in life and among sciences; (2) improbability—the mathematical measure of labor and knowledge; (3) the anatomy of thinking and an interplanetary robot; (4) automated machines; (5) feedback—the basis of automatism in nature and technology; (6) information and cybernetics; (7) information accumulation; (8) information control; (9) behavior; (10) signal converters; (11) logical machines; (12) automatic computing; (13) the statistical machine; (14) the brain—a statistical system of living nerve elements; (15) the complete automation; and (16) cybernetics and humanity. R.T.K.

N64-17288 Stanford Research Inst., Menlo Park, Calif.
RESEARCH ON COMPUTER AUGMENTED INFORMATION MANAGEMENT
Charle P. Bourne Bedford, Mass., Electron. Systems Div., Nov. 1963 59 p refs
(Contract AF 19(628)-2914)
(ESD-TDR-64-177; AD-432098)

The work was concerned primarily with the design and development of an information-management subsystem that would operate in the environment of a cooperative man-computer system for the production of operating computer programs. An experimental system was developed that utilized the AN/FSQ-32 computer in a time-sharing mode of operation, as well as a cathode ray tube display and associated input-output facilities for real-time machine use by a programer. A number of symbol manipulation techniques (e.g., insert, delete) were used for the editing and manipulation of text and programing material on the display. Procedures were established for obtaining and using machine-readable records from all of the project records (e.g., memos, correspondence, bibliographies, reports) generated by the user group, to serve as the basis for an experimental machine file. This machine file was established along with appropriate file search routines, to permit the reading of the natural text of the file material. Author

N64-18450* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
A TECHNIQUE FOR ESTIMATING FUNDING AND MANPOWER REQUIREMENTS FOR RESEARCH AND DEVELOPMENT LONG-RANGE PLANNING

Frank E. Goddard, Jr., William H. Bayley, David K. Carlisle, James R. Edberg, and Fred H. Felberg 8 Nov. 1962 19 p
(NASA Contract NAS7-100)
(NASA CR-53571; JPL Planning Rept. 35-6 (Rev. 1)) OTS: $1.60 ph

This report outlines the technique that has evolved from a study of the long-range programing problem. The material is extracted from an internal planning report and is presented only as one method by which estimates of resource requirements can be made. Charts and figures required to understand the technique are presented, together with a simplified step-by-step procedural example showing how estimated requirements are determined for a given project that, in itself, is a component part of a program and of the overall installation effort. Author

N64-18926 California U., Berkeley Operations Research Center
NOTES ON OPERATIONS RESEARCH – 2
27 Sep. 1963 29 p refs
(Contract Nonr-222(83))
(ORC-63-23(RN-4); AD-434782)

CONTENTS:

1. GEOMETRIC INTERPRETATION OF DANTZIG'S CONVEX PROGRAMMING ALGORITHM P. Huard p 1-12 refs (See N64-18927 11-20)

2. THE PROBLEM OF THE MAXIMUM FLOW IN TRANSPORTATION WITH CORRESPONDING CONSTRAINTS A. Ghouila-Houri (Natl. Soc. French Railways) p 14-24 (See N64-18928 11-20)

3. A TECHNIQUE FOR RESOLVING DEGENERACY IN LINEAR PROGRAMMING G. B. Dantzig p 26-27 (See N64-18929 11-20)

N64-19054 California U. Berkeley. Operations Research Center
ON A PROBLEM OF OPTIMUM PRIORITY CLASSIFICATION
Robert M. Oliver and Gerold Pestalozzi 30 Dec. 1963 26 p refs
(Contract Nonr-222(83); NSF Grant 21034)
(ORC 63-29(RR); AD-434807)

This article is concerned with the improvement of a customer-service system by segregation of the customers into priority classes. Consideration is given the extreme case in which the service time of a customer is known exactly from the moment the customer joins the queue of the service facility. The following problem is proposed. With a fixed number of priority classes, how should priorities be assigned to customers in order to minimize expected queueing time of all the customers using the service system. It is shown that this decision problem can be formulated in terms of a nonpreemptive priority queueing model, and that the mathematical optimization can be expressed as a functional equation involving two variables—the number of priority classes, and the truncation point that separates two priority classes. C.L.W.

N64-19655 Air Force Systems Command, Wright-Patterson AFB, Ohio AF Flight Dynamics Lab.
OPTIMIZATION TECHNIQUES – A COMPARISON
L. Schwartz Mar. 1964 32 p refs
(FDL-TDR-64-21; AD-437895)

A single-axis satellite attitude control system is used as an example for the application of several optimization techniques. The vehicle and actuator dynamics are linear, and the performance criterion is quadratic (related to minimum-energy control). The techniques used are the classical calculus of variations, the maximum principle, dynamic programing, and steepest descent. Author

N64-21601 Federal Council For Science and Tech., Washington, D.C.
CURRENT PROBLEMS IN THE MANAGEMENT OF SCIENTIFIC PERSONNEL
[1963] 125 p Proc. of the First Symp., 17-18 Oct. 1963

CONTENTS:

1. CAREER DEVELOPMENT OF FEDERAL SCIENTISTS AND ENGINEERS—I. RECOGNITION OF RESEARCH COMPETENCE B. T. Shaw (Agricultural Res. Service) p 3-28 (See N64-21602 15-01)

2. CAREER DEVELOPMENT OF FEDERAL SCIENTISTS AND ENGINEERS—II. INCENTIVES AND EVALUATION F. J. Weyl (ONR) p 28-45 (See N64-21603 15-01)

3. CAREER DEVELOPMENT OF FEDERAL SCIENTISTS AND ENGINEERS—III. THE SENIOR SCIENTIST H. J. Goett (NASA) p 46-69 (See N64-21604 15-01)

4. CURRENT CONTROVERSIES IN SCIENTIFIC PERSONNEL ADMINISTRATION L. Carmichael (Smithsonian Inst.) p 69-91 (See N64-21605 15-01)

5. LOOKING AHEAD IN FEDERAL SCIENCE ADMINISTRATION J. W. Macy, Jr. (C.S.C.) p 92-104 (See N64-21606 15-01)

6. CONFLICT OF INTEREST AND THE FEDERAL SCIENTIST T. B. Nolan (Geol. Surv.) p 104-121 (See N64-21607 15-01)

N64-21602 Agricultural Research Service, Washington, D.C.
CAREER DEVELOPMENT OF FEDERAL SCIENTISTS AND ENGINEERS–I. RECOGNITION OF RESEARCH COMPETENCE
Byron T. Shaw et al *In* Federal Council for Sci. and Technol. Current Probl. in the Management of Sci. Personnel [1963] p 3-28 (See N64-21601 15-01)

The system available at the Civil Service Commission for recognizing and rewarding research competence is discussed, and the utilization of this system at the Goddard Space Flight Center and at the Department of Agriculture is described. I.v.L.

N64-21603 Office of Naval Research, Washington, D.C.
CAREER DEVELOPMENT OF FEDERAL SCIENTISTS AND ENGINEERS–II. INCENTIVES AND EVALUATIONS
F. J. Weyl et al *In* Federal Council for Sci. and Technol. Current Probl. in the Management of Sci. Personnel [1963] p 28–45 (See N64-21601 15-01)

This report discusses the following: (1) problems that have arisen in the management of the various in-grade step increases that current personnel regulations allow, and the formulation of a program that would include both Ramspeck and incentive features—this program would provide incentives to the employees, flexibility to the supervisor, maintain the length-of-service principle, and clear up some of the semantics; (2) the Salary Reform Act that gave the Federal manager two new authorities to control the take-home pay of his employees. The positive side is the quality increase, the extra increase no more than once a year for the person whose work is of high quality; the other side is the authority of management to grant the regular increase only if work is of an acceptable level of competence, as determined by the department head; and (3) the Incentive Awards Act with special rewards, either commendations or money, all the way from a dollar bill to $25,000 for unusually competent performance. I.v.L.

N64-21604* National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.
CAREER DEVELOPMENT OF FEDERAL SCIENTISTS AND ENGINEERS—III. THE SENIOR SCIENTIST
Harry J. Goett et al *In* Federal Council for Sci. and Technol. Current Probl. in the Management of Sci. Personnel [1963] p 46–69 (See N64-21601 15-01)

The following topics are reviewed: (1) the statutory and administrative framework governing the appointment and promotion of scientists and engineers to top levels in the Civil Service Commission system; (2) the policy of the Department of Defense for providing an orderly career structure for the top technical personnel through the combined use of Public Law 313 and nonquota supergrade authorities; and (3) the possibility of merging Public Law 313 and Section 208(g) of the Public Health Service Act into one operable group at NIH. I.v.L.

N64-21605 Smithsonian Institution, Washington, D.C.
CURRENT CONTROVERSIES IN SCIENTIFIC PERSONNEL ADMINISTRATION
Leonard Carmichael et al *In* Federal Council for Sci. and Technol. Current Probl. in the Management of Sci. Personnel [1963] p 69–91 (See N64-21601 15-01)

Personal attributes and interpersonal relations of scientists are discussed. Topnotch scientists have, without exception, a high degree of personal involvement in the job they are doing. It matters more to them than anything else. They also possess a high degree of curiosity. Scientists in various fields differ in verbal, mathematical, and spatial test ratings; these differences are discussed. Scientists prefer mental manipulations involving things rather than people. Their general interpersonal attitude is one of indifference, or withdrawal. They tend to be dominant, but not controversial, personalities. They do not want to be pushed around but, for the most part, neither are they likely to be pushing anyone else around. In dealing with the neurotic differences among scientists, their characteristic mechanism is to repress difficulty or to get away from it. Also, the problem of identifying the superior scientist, especially before he becomes superior, is discussed. I.v.L.

N64-21606 Civil Service Commission, Washington, D.C.
LOOKING AHEAD IN FEDERAL SCIENCE ADMINISTRATION
John W. Macy, Jr. *In* Federal Council for Sci. and Technol. Current Probl. in the Management of Sci. Personnel [1963] p 92–104 (See N64-21601 15-01)

Government-operated laboratories are proposed. Aspects of the proposal discussed include a rational management approach, staffing, locations, and compensations and benefits. I.v.L.

N64-21607 Geological Survey, Washington, D.C.
CONFLICT OF INTEREST AND THE FEDERAL SCIENTIST
Thomas B. Nolan et al *In* Federal Council for Sci. and Technol. Current Probl. in the Management of Sci. Personnel [1963] p 104–121 (See N64-21601 15-01)

The following topics are reviewed: (1) problems presented to the Federal scientist and to the manager in determining the extent to which the Federal scientist can participate in education and in university activities; (2) the outside interests of the Federal scientist—the degree to which he may participate, either through investments or through consulting services, in areas that are related to but not directly concerned with his own employment; and (3) problems that are presented by the Federal scientist as a result of his development of new ideas, which he proposes to regularize, either through the patent mechanism or through the preparation of papers or books for outside publication. I.v.L.

N64-22200 Lockheed Missiles and Space Co., Sunnyvale, Calif. Technical Information Center
LONG-RANGE PLANNING AND TECHNOLOGICAL FORECASTING: AN ANNOTATED BIBLIOGRAPHY
Peter R. Stromer, comp. Nov. 1963 46 p refs
(SRB-63-12; Rept.-5-47-63-1)

A survey was made of the recent aerospace and business management literature covering the broad spectrum of long-range planning and technological forecasting. While emphasis was placed on applicability to the aerospace and defense industry, additional inputs detailing the general philosophy and techniques of industrial and government planning and related subject fields of economic projections, resource allocations, and cost analyses have been included. A subject index facilitates use of this material. Author

N64-22567 Tufts U., Medford, Mass.
BELIEF STATES: A PRELIMINARY EMPIRICAL STUDY
Thornton B. Roby Bedford, Mass., Electronic Systems Div., Mar. 1964 42 p ref
(Contract AF 19(628)2450; Grant NSF G-10947)
(ESD-TDR-64-238; AD-600441)

The belief state, as a technique for describing beliefs, attitudes, and judgments, is proposed here as an important adjunct to psychological research, especially in the areas of decision making by individuals and by groups. The belief state is defined as a device for representing in probabilistic form an exact quantitative description of the information or beliefs an individual has about possible alternative conditions of the external world. The present study investigates the feasibility of measuring belief states in a simple laboratory situation, and of ascertaining by various statistical tests the degree to which these empirical measures conform to the normative standard of a perfect Bayesian calculation. It is shown that subjects in general depart from the standard in certain properties: that there are reliable individual differences among a subject's belief state measures as an apparent result of increasing experience with the task. Several suggestions are offered for future investigations of these measures under more closely controlled conditions. Author

N64-23327* National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md
MOTIVATION OF TECHNICAL PERSONNEL
Michael J. Vaccaro N.Y., AIAA [1964] 7 p Presented at the 1st AIAA Ann. Meeting, Washington, D.C., 29 Jun–2 Jul 1964 (AIAA Paper-64-407) AIAA: $0.50 members, $1.00 nonmembers

This paper is concerned with a human-relations investigation of a group of aerospace research and development general-management and project-management personnel to ascertain the following: (1) which motivational elements served as stimulators and which served as dissatisfiers; and (2) to what extent did the provision by the Government of an incentive contract serve to assist these organizations in establishing the climate for attracting and retaining technical personnel. N.F.A.

N64-25571* Lockheed Missiles and Space Co., Sunnyvale, Calif. Nuclear Space Programs

PROGRESS OF RIFT MANUFACTURING PLAN. VOLUME I: MANUFACTURING OPERATIONS

11 Oct. 1963 26 p Presented at the Third Rift Mfg. Eng. Working Group Meeting

(Contract NAS8-5600)

(NASA-CR-56833; NSP-63-106) OTS: $2.60 ph

Progress is reported in the operations of the RIFT manufacturing plan. This volume is considered as the basic plan, and was written to acquaint personnel with the overall Saturn nuclear stage program and its implementation by fabrication, assembly, tooling, handling, and testing. The design of the LH_2 tank is discussed in some detail; its final assembly sequence is illustrated. A section is devoted to the integration of structural engineering development with the manufacturing welding process. G.D.B

N64-28451 Lockheed Missiles and Space Co., Sunnyvale, Calif.

CREATIVITY, INNOVATION, AND INVENTION: AN ANNOTATED BIBLIOGRAPHY

George R. Evans and Peter R. Stromer, comp. Aug. 1964 18 p

The recent business management literature has been surveyed to assess the current trends and developments in the field of creativity, innovation, and invention. The literature reveals that some tentative yardsticks are now available to identify creative talent and the means for optimizing its usage in industry. The importance of innovation and its successful implementation by both the military and the aerospace industry is stressed as companies seek to adapt their work force and facilities to new markets. Author

N64-28572 Aircraft Armaments, Inc., Cockeysville, Md

ORGANIZATIONAL MODELS FOR COMMAND POST INFORMATION SYSTEMS Final Report

Bedford, Mass., ESD, Jun. 1964 49 p

(Contract AF 19(628)-2960)

(ESD-TDR-64-438; AD-603969)

This report attempts to clarify issues concerning the organization and functions of command post information systems (CPIS) The purpose of the report is to provide system designers with a better understanding of factors that influence the operation of a CPIS and that constrain system design alternatives. A CPIS is viewed as one of four systems making up a command post—the others being a command system, a weapon system, and a support system. The Air Force organization is discussed in the light of this concept, with special emphasis being placed on the relationship of the Air Force to the unified commands and the "L" systems. The insights gained from this analysis are incorporated into a conceptual model. This model provides the system designer with a conceptual framework for designing an integrated CPIS. An evaluation model, permitting the system designer to test certain design alternatives, was suggested as an extension of the conceptual model. Application of these models by a system designer will greatly facilitate the design of a CPIS. Author

N64-28816 RAND Corp., Santa Monica, Calif.

THE USEFULNESS OF AEROSPACE MANAGEMENT TECHNIQUES IN OTHER SECTORS OF THE ECONOMY

Thomas K. Glennan, Jr. Jun. 1964 9 p Presented at the NASA-UCLA Symp. and Workshop on the Transformation of Knowledge and its Utilization, Los Angeles, 2 Jun. 1964

(P-2921; AD-601619)

The managerial techniques used in the aerospace industries have been shaped by the unique conditions surrounding these industries. The demands of their most important customer (the Government), the frequent combination of large state-of-the-art advances with great development urgency, and the large size of many projects have combined to shape management techniques and systems. It is suggested that these techniques cannot be translated or transferred into other industries without extensive modifications, and yet many similar qualities to processes, which appear in other industries, exist. Thus, a selective utilization of some parts of the managerial techniques is likely to have a very profound effect upon other industries. It is up to the managers of industries to seek out those components of the aerospace managerial systems that make sense to them. I.v.L.

N64-30348* General Electric Co., Schenectady, N.Y. Aerospace and Defense Group

SPACE TECHNOLOGY'S POTENTIAL FOR INDUSTRY

J. S. Parker *In* NASA, Washington Proc. of the 4th Natl. Conf. on the Peaceful Uses of Space 1964 p 213-217 (See N64-30326 22-01) GPO: $1.50

The transfer of space-technology developments to the civilian sector of the economy has a time lag, which varies in different fields. The increased ability of industry to manage larger, more complicated systems is the field in which there will be the most immediate effect. The transfer of technology will require more time and effort to convert because of the commercial climate of economic competition. As far as specific products and components are concerned, there are only a few isolated items for which the need and cost parameter are such that they are immediate candidates for transfer to commerical application; weather and communications satellites are two noteworthy examples. The importance of market development to create a need product is emphasized. R.L.K.

N64-30350* Massachusetts Inst. of Tech., Cambridge

NEW ENGLAND'S STAKE IN THE SPACE PROGRAM

James Mc Cormack *In* NASA, Washington Proc. of the 4th Natl. Conf. on the Peaceful uses of Space 1964 p 223-225 (See N64-30326 22-01) GPO: $1.50

The suggestion is made that an innovation in management is needed if New England is to capitalize on the space program ideas created in that area. R.L.K.

N64-30471 Hughes Dynamics, Inc., Los Angeles, Calif.

METHODOLOGIES FOR SYSTEM DESIGN Final Report

Ronald J. Ferris 24 Feb. 1964 97 p

(Contract AF 30(602)-2620)

(RADC-TDR-63-486; AD-434749)

This report presents the results of work on development, programing, and testing of methodologies for aiding information system design and evaluation. They include the following: (1) a first step in formalization of a "calculus of operations" developed for aiding definition of processes for file organization and searching; (2) the complete programs for an evaluation and assignment model, which provide for mechanized determination of the optimum assignment of components and functions to points in a hierarchial reporting structure; and (3) test results on the relative effectiveness (in terms of quality of results and time and cost for the design process) of the measure of system efficiency, the system design model, and the evaluation and assignment programs. Author

N64-32217 Office of Naval Research, Washington, D.C.
AN EXPLORATORY STUDY IN RESEARCH PLANNING METHODOLOGY
Herman I. Shaller Sep. 1963 19 p ref
(ONR-ACR/NAR-27)

A quantitative methodology for use as an aid to research program planning is sought. An operations research approach to the problem is described, and a generalized systems concept of the research planning process is outlined as background material for the analytical techniques proposed. There are three basic ingredients to the proposed research planning system. The first is the concept of a category-attribute matrix, which describes numerical relationships between desired attributes of a research program and categories of research. The matrix yields a numerical output called "effectiveness." The second ingredient is a predetermined collection of classification systems, which suggests a set of constraints for a balanced program. The third ingredient is a perturbation technique that is used to answer questions posed to the system. Five theorems are proved, and a model consisting of numerical arrays has been formulated to characterize the state of a program. Author

N64-32591 Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands)
OPERATIONS RESEARCH IV: TITLE-INDEX
Dec. 1963 52 p refs
(TDCK-36938)

This index contains titles of publications announced in the issues O.R. 42 up to and including O.R. 53 of the abstract bulletin "Operations Research," published in 1963. Author

N64-32798 California U., Berkeley Electronics Research Lab.
DECISION MAKING IN INCOMPLETELY KNOWN STOCHASTIC SYSTEMS
J. Raviv 18 Jul 1964 55 p refs
(NSF GP-2413; NSF G-15965)
(Rept.-64-25)

This paper is a study of decision making in a discrete-state discrete-time system whose state transitions constitute a Markov chain with unknown stationary transition matrix P. The states of the system cannot be observed. The decision at each stage is based on observables whose conditional probability distribution, given the state of the system, is known. A class of problems is considered in which the successive observations can be employed to form estimates of $\underline{P}$, with the estimates at time n, $n = 0, 1, 2, \ldots$, then used as a basis for making a decision at time n. The estimates and the corresponding decisions must have the property that as $n \to \infty$, the decision based on the estimate of $\underline{P}$ tends to the optimal decision rule that would be used throughout if $\underline{P}$ were known. Author

A65-10196
GENERALIZATION OF MITROVIC'S METHOD.
D. D. Šiljak (Belgrade, University; Mihailo Pupin Institute, Belgrade, Yugoslavia).
(Institute of Electrical and Electronics Engineers, Summer General Meeting and Nuclear Radiation Effects Conference, Toronto, Canada, June 16-21, 1963, Paper 63-988.)
IEEE Transactions on Applications and Industry, vol. 83, Sept. 1964, p. 314-320; Discussion, G. J. Thaler (U.S. Naval Postgraduate School, Monterey, Calif.), p. 320. 13 refs.

Presentation of a generalization of Mitrovic's graphical method for analysis and synthesis of linear control systems, by which it is possible to designate that arbitrary pairs of coefficients be considered variable. The generalization provides a general graphical method for the synthesis of linear systems, which can be applied whenever it is required to examine how the zeros of an algebraic equation are affected by a change in its coefficients. It is stated that the generalised method achieves the same degree of simplicity as does the method in its primary form. (Author) M.M.

144

A65-10197
THE SENSITIVITY PROBLEM IN CONTINUOUS AND SAMPLED-DATA LINEAR CONTROL SYSTEMS BY GENERALIZED MITROVIC METHOD.
P. Kokotović (Mihailo Pupin Institute, Belgrade, Yugoslavia) and D. D. Šiljak (Belgrade, University; Mihailo Pupin Institute, Belgrade, Yugoslavia).
(Institute of Electrical and Electronics Engineers, Summer General Meeting and Nuclear Radiation Effects Conference, Toronto, Canada, June 16-21, Paper 63-990.)
IEEE Transactions on Applications and Industry, vol. 83, Sept. 1964, p. 321-324. 16 refs.

Presentation of an analytical procedure for solving the sensitivity problem in both the continuous and the sampled-data control systems, based upon the application of the generalized Mitrovic method. It is stated that the proposed procedure, which utilises the pole-zero approach, appears to be a general solution of the sensitivity problem, since it depends on neither the location of system parameters nor the system complexity. In addition, all analytical operations involved in the computation are performed in the real domain. It is emphasised that the presented procedure is conveniently programmed on a digital computer. M.M.

A65-10378
PRESS - THE POOR MAN'S PERT.
Stewart F. Paterson (Westinghouse Electric Corp., Electronic Tube Div., Elmira, N.Y.).
Assembly Engineering, vol. 7, Nov. 1964, p. 39-45.

Description of PRESS (Project Review, Evaluation, and Scheduling System), a critical-path technique of project analysis and review. Projects are considered to be made up of jobs (activities) and results (events). A network is drawn up consisting of a series of events, represented by large circles, which are connected by numbered arrows, representing the individual activities. A basic assumption is that an activity has a definite beginning event and a definite ending event. Several activities can originate from the same event. Conversely, one activity may be preceded by several activities. In the determination of the time values for the network calculations, it is assumed that the time to complete any given job or activity is a variable. The pattern of this time variation may be a normal distribution, one that is skewed left or right, or one that is uniform or spiked. These distributions can be approximated by estimating three time values for each activity: expedited time T_x, the shortest practical time in which an activity can be completed; normal time T_n, the most likely time it would take to complete the activity, or the time that would be allotted if only one estimate is required; and pessimistic time T_p, the time it would take to complete the activity if almost everything went wrong. The three estimates are used in conjunction with a nomograph to determine the expected time t_e, the statistical mean or average value of the three estimated times. (It represents the average time that the activity would take if it were repeated many times.) A project with six activities is followed step-by-step to demonstrate the calculations for a critical path network. The network calculations, performed manually (without the aid of a computer) and adaptable to projects ranging from $1000 to over $500,000, indicate not only the critical path of the project, but also the amount of slack time or float in each branch of the network. W.M.P.

A65-10455 #
INTRODUCTION OF "QUALITY CONTROL GAME."
Yūkō Fujishiro (Toyo Rayon Co., Ltd., Tokyo, Japan).
(Statistical Quality Control, vol. 11, no. 10, 1960; vol. 12, nos. 1, 2, 4, 1961.)
Union of Japanese Scientists and Engineers, Statistical Application Research, Reports, vol. 11, Mar. 1964, p. 13-22. Translation.

The optimalization of the quality-control game, a decision-making game for training or studying experimental decision making to achieve quality goal in industrial management. The subjects considered are: training for the optimalization game, lesson from the effects of the quality control game, the idea of experimental design and the principle for the selection of methods, and how to use the quality control game. M.M.

A65-10317

CONSTRAINED EXTREMIZATION MODELS AND THEIR USE IN DEVELOPING SYSTEM MEASURES.

Abraham Charnes (Northwestern University, Evanston, Ill.) and William W. Cooper (Carnegie Institute of Technology, Pittsburgh, Pa.).

IN: VIEWS ON GENERAL SYSTEMS THEORY: PROCEEDINGS OF THE SECOND SYSTEMS SYMPOSIUM, CASE INSTITUTE OF TECHNOLOGY, CLEVELAND, OHIO, APRIL 1963.
Edited by Mihajlo D. Mesarović.
New York, John Wiley and Sons, Inc., 1964, p. 61-88. 17 refs.

Development of certain general ideas with reference to special artifacts for securing extensions for constrained optimization models, for certain problems of system design. Ways are considered in which optimizations (extremal principles) might be used for purposes such as generating "equivalences" to do the following: (1) obtaining suitable measures for assessing the performance of a system, and (2) guiding and controlling certain kinds of simulation for system design purposes. The discussion is centered about examples in management planning where these measures are used for evaluating design proposals. It is stated that various artifacts make it possible also to utilize constrained extremization models for systems wherein optimization per se is not an issue. Such models may also be used in additional ways when, for instance, further evaluations are wanted to guide additional alterations in a system by reference to by-product information induced by an optimisation principle. M.M.

A65-10717 #

THE GOVERNMENT'S ATTITUDE TOWARD PROFIT.

Dave W. Lang (NASA, Manned Spacecraft Center, Houston, Tex.).

IN: AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, AND NASA, MANNED SPACE FLIGHT MEETING, 3RD, HOUSTON, TEX., NOVEMBER 4-6, 1964, TECHNICAL PAPERS (AIAA Publication CP-10).
New York, American Institute of Aeronautics and Astronautics, 1964, p. 353-355. 7 refs.

Review of changes in Government policies towards profits in the aerospace industry. Shortcomings in cost-plus-fixed-fee contracts are reviewed, and the increasing use of cost-plus-incentive-fee contracts is discussed. The role of competitive pressures in determining profit rates is noted. The incentive contract, with its basic philosophy of reward for good performance and penalty for poor, is concluded to offer the best opportunity for the contractor to achieve higher profits. P.K.

A65-10915

PERT FOR THE ENGINEER.

Jordan Kadet and Bruce H. Frank (Sylvania Electric Products, Inc., Sylvania Electronic Systems Div., Waltham, Mass.).

IEEE Spectrum, vol.1, Nov. 1964, p. 131-137.

Application of PERT (Program Evaluation and Review Technique) to modest engineering tasks and projects. It is reported that PERT techniques for planning and control, involving graphic methods and network analysis to depict and analyze a project, can be applied either formally or informally to large and small projects alike. The networking technique is said to be applicable primarily to the "once-through" type of effort typically associated with the development of a system or subsystem. Topics covered include: what PERT is and is not, defining the job, network planning, time estimating, scheduling, day-to-day control, task plan vs project plan, PERT/COST estimating, and the use of computers. D.H.

A65-11307

ORGANIZING FOR SPACE AGE ACCURACY - THE ROLE OF COST ANALYSIS.

John J. Riordan (Department of Defense, Washington, D.C.).

IN: INSTRUMENT SOCIETY OF AMERICA, ANNUAL CONFERENCE, 19TH, NEW YORK, N.Y., OCTOBER 12-15, 1964, PROCEEDINGS. VOLUME 19. PART I - STANDARDS LABORATORIES AND MEASUREMENT STANDARDS.
Pittsburgh, Instrument Society of America, 1964. 3 p. (Preprint 20.2-2-64).

Review of some DOD policies and programs relevant to management decisions regarding resources applied and organizational plans devised to satisfy needs for space-age accuracy. The comments pertain primarily to industrial organizations doing business with DOD. Specific DOD policies and programs reflecting the cost-effectiveness system of analysis are discussed. It is stated that it seems evident that incentive-type contracting offers sizable opportunities for cost-oriented engineers and scientists to bring their activities into the main stream of space progress. The widespread application of cost-effectiveness analytical techniques, and the strong trend toward incentive-type contracting, have set the stage for closer collaboration between the business and the technical organisational elements within both industry and government. M.M.

A65-11308

INDUSTRY PROBLEMS WITH SPACE AGE ACCURACY AND RELIABILITY REQUIREMENTS.

Frank McGinnis (Sperry Rand Corp., Sperry Gyroscope Co., Great Neck, N.Y.).

IN: INSTRUMENT SOCIETY OF AMERICA, ANNUAL CONFERENCE, 19TH, NEW YORK, N.Y., OCTOBER 12-15, 1964, PROCEEDINGS. VOLUME 19. PART I - STANDARDS LABORATORIES AND MEASUREMENT STANDARDS.
Pittsburgh, Instrument Society of America, 1964. 3 p. (Preprint 20.2-6-64).

Discussion of the inability of scientists and engineers to demonstrate effectively the seriousness of measurement and reliability problems to policy level decision-makers. It is stated that the removal of the obstacles of misunderstanding can be effected by translating all recommendations on these problems into terms of dollars and cents. Under the leadership of the National Bureau of Standards, a program might be inaugurated which would better utilize our combined national resources in metrology to the benefit of all. Bureau people might find time for more research, new services might be added, and old services improved. M.M.

A65-11442

FUNDAMENTALS OF COMPUTER TECHNOLOGY [OSNOVY VYCHISLITEL'NOI TEKHNIKI]. 2nd Edition.

Evgenii Afanas'evich Drozdov, Vadim Ivanovich Prokhorov, and Aleksandr Petrovich Piatibratov.

Moscow, Voennoe Izdatel'stvo Ministerstva Oborony SSSR, 1964 464 p. In Russian.

This book discusses the basic principles of electronic digital computers and the programming of problems for the solution on the computers. Chapter I examines the arithmetical and logical principles of digital computers. Chapter II examines the various types of digital computers, the basic units of a digital computer, and the representation of digital numbers in a digital computer. Chapter III presents a classification of computer elements, and discusses the ferrite core, logical circuits using ferrite-diode cells, ferrite-transistor cells, logical circuits using ferrite-transistor cells, and various triggers, counters, and registers. Chapter IV deals with the various types of storage used in digital computers. Chapter V reviewes the various types of arithmetic units and adders, including multipliers and dividers using adder accumulators. Chapter VI describes data input and output units, the conversion of alternating quantities into discrete quantities and vice versa, and some other conversion types. Chapter VII examines the general characteristics of control units of single-address and three-address computers. Chapter VIII reviews the various types of programs used in digital computers, including programs based on tabulated functions. The book is designed primarily for military personnel as an aid in computer training, but also for students of computer technology. V.P.

A65-11940

NOTES ON THE DEVELOPMENT OF NETWORK MODELS FOR RESOURCE ALLOCATION IN R & D PROJECTS.

Richard S. Rosenbloom (Harvard University, Graduate School of Business Administration, Boston, Mass.).

IEEE Transactions on Engineering Management, vol. EM-11, June 1964, p. 58-63. 29 refs.

Discussion of the extension of PERT and critical path-planning models for the analysis of cost-time tradeoffs and resource allocation. Various scheduling algorithms with and without resource constraints are noted and compared, as reported in the literature. Key assumptions and some practical limitations are analyzed. Recommendations for further research are offered. It is concluded that, in complex projects where more than one efficient duration can be specified for an activity given a constant level of technical performance, and where reasonably good estimates of duration can be made, a network model for analysis of the efficiency and capacity problems ought to serve a useful role in management planning. (Author) M.M.

A65-11941

RELIABILITY PROGRAM PLAN FOR R & D ORGANIZATIONS.

Patrick T. Komiske (Johns Hopkins University, Silver Spring, Md.).

IEEE Transactions on Engineering Management, vol. EM-11, June 1964, p. 75-77.

Outline of a reliability program plan, considered a minimum program for a research and development laboratory or industrial company. It is stated that, if a requirement exists for a research and development laboratory to set up a reliability program, it should determine the desirability of having an overall reliability program which encompasses all projects, or applying this reliability program to individual projects as required by military requirements. Projects are defined as tasks or programs contracted or subcontracted to the research and development laboratory where the research and development laboratory must provide certain defined output - e.g., a computer system. It is pointed out that the latter approach warrants serious consideration, since it will allow the laboratory's operation to be free of the unnecessary constraints a reliability program imposes. (Author) M.M.

A65-11942

PERT/PMD-PROJECT MONITORING DEVICE.

E. J. Johnson (System Development Corp., Paramus, N.J.).

IEEE Transactions on Engineering Management, vol. EM-11, June 1964, p. 82-84.

Description of the PERT Project Monitoring Device using the basic networking system of PERT for representation of a schedule. It is stated, however, that the PMD approach to a network is unlike that of PERT. The PMD uses activities as the basic units of a schedule, rather than the time of occurrence of events as in PERT. The use of this approach leads to the discovery of the fact that a scheduling system could be logically derived with capabilities not found in existing PERT systems. The capabilities that exist in the current model of the PMD are listed. It is pointed out that because of these added capabilities, the PMD is particularly suitable for research and development projects where a knowledge of all activities necessary to the development of a product may not be ... available or known at the start of the project. M.M.

A65-12577

SUMMARY OF MANAGEMENT AND OPERATIONAL PHILOSOPHY.

Paul E. Purser (NASA, Manned Spacecraft Center, Houston, Tex.).

IN: MANNED SPACECRAFT - ENGINEERING DESIGN AND OPERATION.

Edited by Paul E. Purser, Maxime A. Faget, and Norman F. Smith. New York, Fairchild Publications, Inc., 1964, p. 491-495. 5 refs.

Discussion of the general management and operational philosophies of manned spacecraft programs. Progress and cost estimation methods are reviewed, including the Program Evaluation and Review Technique (PERT). A technical management procedure involving the establishment of panels of technical personnel from different organizations concerned with the project is described. Difficulties arising from cost-plus-fixed-fee contracts are discussed. Basic operational considerations are described, covering mission, ground-network, preflight, mission-control, and training preparations. P.K.

A65-12837

PROGRAM MANAGEMENT UNDER FIXED PRICE CONTRACTS.

J. C. Brizendine (Douglas Aircraft Co., Inc., Aircraft Div., DC-9 Program, Long Beach, Calif.).

Society of Automotive Engineers, National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 5-9, 1964, Paper 926C. 6 p.

Members, $0.75; nonmembers, $1.00.

Discussion of the concept of program management in today's aerospace business in relation to the requirement for an effective management to cope with a complex management task involving multiple interfaces of business and technical disciplines. Some organisational precepts are presented as being fundamental to achieving an effective management system in a multi-program company environment of major aerospace programs. The program management system evolved for the development of the DC-9 Jet Transport is described to illustrate the implementation of the concept. In this program, each program manager has under his direct control the function of contract administration, subcontract administration, work authorisation, budget authorization, cost control, and the measurement and control of program progress. M.G.

A65-12838

RESEARCH AND DEVELOPMENT CAN BE CONTROLLED.

E. C. Soistman (Martin Marietta Corp., Martin Co., Baltimore, Md.).

Society of Automotive Engineers, National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 5-9, 1964, Paper 926A. 7 p.

Members, $0.75; nonmembers, $1.00.

Description of a management technique to monitor and control research tasks as to cost and scheduled objectives. An input-output technique used for all projects, hardware, development, study, and research is described, and a typical input-output performance chart is presented. The function of a planner is outlined, whose questioning, monitoring, analyses, and evaluations pinpoint problems and coordinate the actions of the technical and support team.

A65-12839

SUCCESS STRATEGY FOR TECHNICALLY ORIENTED MANAGEMENT.

James A. Broadston (North American Aviation, Inc., Rocketdyne Div., El Segundo, Calif.).

Society of Automotive Engineers, National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 5-9, 1964, Paper 926B. 8 p. 22 refs.

Members, $0.75; nonmembers, $1.00.

General discussion of the relationship between the basic skills of the economists and behavioral scientists in regard to management decisions. The purpose of the paper is to encourage technical management to realize that both technical and economic success in producing a product competitively depend upon the effective utilisation of human resources through proper motivation. It is shown that this is only possible when personal goals and company goals are integrated. It is suggested that a basic responsibility of management is to create conditions such that members of the organization can achieve their own goals best by directing their efforts toward the success of the enterprise. M.G.

A65-13154 #

PROBLEMS AND PITFALLS IN IMPLEMENTING MANAGEMENT INFORMATION SYSTEMS.

Russell D. Archibald (CPM Systems, Inc., Encino, Calif.) and Richard L. Villoria (Houston Fearless Corp., Los Angeles, Calif.).

American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 29-Dec. 4, 1964, Paper 64 - WA/MGT-1. 8 p.

Members, $0.50; nonmembers, $1.00.

Discussion of the fundamental causes of the difficulties which prevent effective application of contemporary management information systems. These difficulties relate to the effects of change and technological system deficiencies. Methods of minimizing these problems include: (1) the adequate definition of system objectives, (2) placing responsibility in the hands of operating management rather than staff specialists, (3) using the task force approach, and (4) continual education and training of all affected persons. The PERT/COST system is used to illustrate specific examples of the problems encountered. T.V.Y.

A65-13300

ENGINEERING CONSIDERATIONS TO OBTAIN AN OPERATIONAL SYSTEM.

William J. Bobisch (U.S. Navy, Bureau of Yards and Docks, Engineering Div., Washington, D.C.).

(New York Academy of Sciences, Conference on Large Steerable Radio Antennas - Climatological and Aerodynamic Considerations, New York, N.Y., Sept. 4-6, 1963.)

New York Academy of Sciences, Annals, vol. 116, June 26, 1964, p. 339-344.

Discussion of the technical and management engineering considerations required to ensure that a system is operational and meets known requirements. These considerations include the determination of the type of the antenna, selection of the basic criteria and design criteria, the determination of the forces on the antenna, the use of a systems approach to engineering design, blocking out of major engineering problems, the determination of interfaces, the development of trade-offs, and the use of mathematical and computer simulation. M.L.

A65-13346

HOW PERT PAID ITS WAY IN THE C-141A STARLIFTER PROGRAM.

Hans H. Driessnack (USAF, Washington, D. C.).

Armed Forces Management, vol. 11, Dec. 1964, p. 44-46.

Description of the application of the PERT (Program Evaluation and Review Technique) to the management of the Air Force C-141A Starlifter Program. Air Force and Lockheed management personnel used PERT from the proposal stage through the delivery of the hardware to "flag" and isolate problem areas. The manner in which the PERT was implemented and used, enabling the C-141A to be completed and flown on schedule, is discussed. P. K.

A65-15632

NOTE ON THE SETTING UP OF A DEPENDABILITY GROUP WITHIN A CORPORATION [NOTE SUR LA MISE EN PLACE D'UN GROUPE DE FIABILITE DANS L'ENTREPRISE].

G. Cohen.

Doc-Air-Espace, Nov. 1964, p. 37-40. In French.

Discussion of the necessity of entrusting all matters pertaining to material dependability to a special group to be attached to a company. The following subjects are considered: (1) organization of the dependability unit and program for its implementation; (2) activity and means of the "Dependability Group;" work assignment, aptitudes, size, staff, and cost. M. M

A65-16855

TOOLS OF AIRLINE MANAGEMENT.

J. T. Dyment (Air Canada, Montreal, Canada).

(Royal Aeronautical Society, British Commonwealth Lecture, 20th, London, England, Oct. 15, 1964.)

Royal Aeronautical Society, Journal, vol. 69, Jan. 1965, p. 9-24; Discussion, p. 24-26. 6 refs.

Review of some typical modern management tools in the light of increasing competition. Although it is felt that the use of electronic data processing equipment (EDP) can be overdone, it is believed that, when wisely used, EDP can be of tremendous help in enabling management to fulfill its responsibilities and to make good decisions. Many areas where EDP has been used to advantage are reviewed, including processes used for planning, marketing, maintenance, inventory, finance, personnel, and on-line systems such as automatic reservations, teletype switching, etc. Although the examples represent modern airline management techniques, they are also usable by many other industries. Other tools reviewed include a system of customer service measurements to provide management with indices of the quality of the services it is giving to its customers and an extensive management development program to build an efficient team of managers and supervisors. Where rapidly growing techniques such as Critical Path and PERT can be used, these are also reviewed. (Author) W. M. R.

A65-17078

VALUE ENGINEERING AND THE VTOL.

Donald M. Plumb (United Aircraft Corp., Sikorsky Aircraft Div., Stratford, Conn.).

Society of Automotive Engineers, International Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1965, Paper 976C. 8 p. 6 refs.

Members, $0.75; nonmembers, $1.00.

Description of the technique of value engineering as a means of reducing the cost of VTOL. Value engineering follows an orderly procedure involving a "job plan" and depends upon an exhaustive search for alternates. Brainstorming and creativity are two of the more potent activities. New concepts, new methods, and new materials are studied for their effect upon the cost pattern of providing the function. The application of value engineering principles has shown that, even at the mockup and early design stages, lower costs can be achieved in the VTOL field. In a recent VTOL development, value studies produced a number of cost reductions before and during this period. Several examples are given. A. B. K.

A65-18292

PROBLEMS IN EVALUATING SYSTEM MANNING REQUIREMENTS ESTIMATES AND ESTIMATION TECHNIQUES.

Sidney Gael (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).

Human Factors, vol. 6, Jun. 1964, p. 299-303. 9 refs.

Consideration of system manning requirements information which is desired prior to the time when it is scheduled to become available under the personnel subsystem concept. Rather than proceed from the conclusion that a new manning estimation method is needed to obtain manning information earlier, it is assumed that present methods can be used. It is stated that support for the assumption was to be obtained by validating manning requirements estimates for several systems, and assessing the adequacy of the estimation methods. Problems that arose in conducting the study are discussed. The shortcomings of the Mace B and the Bomarc manning requirements analyses are discussed along with the inappropriateness of system test data as criteria against which to evaluate manning estimates. The human factors system analysis approach, modified to account for pertinent quantitative data, is recommended for estimating manning requirements during the initial stage of system development. (Author) M. M.

A65-18752

CUSTOMERIZING RELIABILITY PROGRAMS.

Carl M. Bird and Carl J. Napolitano (International Business Machines Corp., Space Guidance Center, Owego, N. Y.).

IN: NATIONAL SYMPOSIUM ON RELIABILITY AND QUALITY CONTROL, 11TH, MIAMI BEACH, FLA., JANUARY 12-14, 1965, PROCEEDINGS. [A65-18710 09-15]

Symposium sponsored by the Institute of Electrical and Electronics Engineers, American Society for Quality Control, American Society of Mechanical Engineers, Institute of Environmental Sciences, and Society for Nondestructive Testing.

New York, Institute of Electrical and Electronics Engineers, 1965, p. 419-426.

Presentation of an approach using value analysis concepts to support engineering judgment in designing reliability programs to specific customer needs. The approach is defined by presenting an example of one high reliability program. A comprehensive listing of reliability tasks is provided as a planning guide, and an approach for numerically assessing the value of each task for a given product is introduced. It is concluded that the value analysis approach can be an extremely useful tool in determining the proper allocation of time and funds to achieve maximum reliability. M. L.

A65-18776

PROJECT ESTIMATING BY ENGINEERING METHODS.

P. F. Gallagher (Hughes Aircraft Co., Aerospace Group, El Segundo, Calif.).

New York, Hayden Book Co., Inc., 1965. 336 p. $15.

The object of this book is to assist the estimator who must often work with limited information, and to provide him with methods that are applicable to any level of estimating, or state of engineering. Five methods of estimating are outlined, four of them as preliminaries to the fifth. The fifth method combines the two most important scientific developments in estimating - standard hours and the learning curve - into a simple, practical estimating method, which is presented here for the first time. Method 5 is said to meet the need to readily compare all available information to previous experience on similar work. Examples and nomograms and a complete estimate for a hypothetical firm are given in detail. A thorough coverage of the construction and use of learning curves is given to ensure a complete understanding. Nearly one hundred pages of learning-curve tables appear in the appendix. Manpower requirements per project, dollar requirements for material, total product funds, commitments, and expenditures for a program forecast have been simplified by the use of examples and charts. Implementation and methods of estimating implementation have been included, together with distribution-curve tables. This book is intended to be of practical usefulness to working estimators, engineers, buyers, schedulers, and cost accountants. A. B. K.

A65-18846
THE INFLUENCE OF PRICE ON THE NORTH ATLANTIC AIRLINE MARKET.
W. M. Wallace (Emerson Consultants, Ltd., London, England).
Journal of Air Law and Commerce, vol. 30, Autumn 1964, p. 369-374.

Study made for the purpose of estimating the consequences of a North Atlantic fare reduction resulting from recent IATA negotiations. The approach is based on demand curve analysis, and past traffic trends are examined with a view to isolating the effect of such historical fare reductions as the introduction of tourist and economy classes from other variables such as better equipment and improving economic conditions. A. B. K.

A65-19582
EXPEDITING DESIGN TRADE-OFFS BY USING RELATIVE COST.
Robert T. Smith (Douglas Aircraft Co., Inc., Aircraft Div., Long Beach, Calif.).
IN: ASTME, WESTERN METAL AND TOOL EXPOSITION AND CONFERENCE, LOS ANGELES, CALIF., FEBRUARY 22-26, 1965, COLLECTED PAPERS. [A65-19577 09-15]
Dearborn, American Society of Tool and Manufacturing Engineers, 1965, Paper 666. 8 p.

Illustration of how the use of a relative cost handbook will assist the value-trained designer in evaluating his efforts, using relative cost as a design parameter. It is said that with this handbook the designer will be able to make "rule-of-thumb" cost comparisons for design alternatives which provide the equivalent functions. These costs are not used to measure the efficiency of the shop, but are developed as a means for measuring the cost-effectiveness of a function or design. (Author) A. B. K.

A65-19583
MANAGEMENT OF NUMERICAL CONTROL.
Walter H. Friedlander (General Dynamics Corp., General Dynamics/Pomona, Pomona, Calif.).
IN: ASTME, WESTERN METAL AND TOOL EXPOSITION AND CONFERENCE, LOS ANGELES, CALIF., FEBRUARY 22-26, 1965 COLLECTED PAPERS. [A65-19577 09-15]
Dearborn, American Society of Tool and Manufacturing Engineers, 1965, Paper 668. 13 p.

Analysis of some of the considerations governing decision-making in certain areas of numerical control. Various factors contributing to the cost of the operation are examined individually, and the value of the contribution made by each is assessed. A. B. K.

A65-19773
THE PONTRYAGIN MAXIMUM PRINCIPLE AND SOME OF ITS APPLICATIONS.
James S. Meditch (Aerospace Corp., Los Angeles, Calif.).
IN: ADVANCES IN CONTROL SYSTEMS. VOLUME 1.
Edited by C. T. Leondes.
New York, Academic Press, Inc., 1964, p. 55-74. 12 refs.

Summary of some of the fundamental results of the Pontryagin maximum principle, and demonstration of the manner in which they may be exploited in control system studies. The results are only interpreted and used; the fundamental theorems are simply stated without proof. It is shown how the maximum principle can be used to develop properties of optimal controls and thereby lend insight into system design. A design study is presented in which the maximum principle is applied to develop an optimal thrust program for a lunar space mission. A particular example is given of how the maximum principle can be used to effect a particular design. It is noted, however, that the actual design of a complete system for the assumed mission would involve considerably more detail than has been presented. In any event, the general form of the thrust program is established, and the type of hardware needed to implement the optimal system is indicated. M. M.

A65-21081
THE CASE FOR GOING TO THE MOON. VII - THE CASE FOR TECHNOLOGICAL TRANSFER.
Neil P. Ruzic.
Industrial Research, vol. 7, Mar. 1965, p. 67-78, 80-87.

Discussion of potential areas for the utilization of space technology by-products in industrial and commercial applications. Covered are the commercial uses of instrumentation, components, materials, and fabrication methods developed or improved for space applications, as well as the space-induced advances in solid-state, cryogenic, and computer technology. Additional, less tangible benefits from the space program and the effort to explore the Moon involve the diversion of some of the economic and psychological causes of war to a more constructive, or at least less destructive, purpose. P. K.

A65-21357
ORGANIZATION AND MANAGEMENT OF SPACE PROGRAMS.
Fremont E. Kast and James E. Rosenzweig (Washington, University College of Business Administration, Seattle, Wash.).
IN: ADVANCES IN SPACE SCIENCE AND TECHNOLOGY. VOLUME 7.
Edited by F. I. Ordway, III.
New York, Academic Press, Inc., 1965, p. 273-364. 24 refs.

Discussion of various aspects of the management of space programs. The topics considered are: (1) science, technology, and management; (2) systems concepts; (3) program management; (4) organization of space activities; (5) critical aspects in the management of space programs; (6) tools and techniques; and (7) summary and implications for the future. M. M.

A65-22760
PROJECT SCHEDULING - THE SECOND GENERATION.
James J. O'Brien.
Machine Design, vol. 37, Apr. 29, 1965, p. 172-181.

Discussion of major extensions to both PERT and CPM, and of the state of the art of the two similar systems, which are tools for scheduling the design and development work of engineering personnel Both systems are considered equally good at the prime tasks of planning the logical order of assignments. A network diagram is presented for a prototype air-ground signal unit, demonstrating how PERT and CPM are used. Data are obtained from a computer. PERT-cost and its CPM equivalent, COP (Control of Profit), are defined and discussed. With CPM, expenditure rates can be forecast. An extension to CPM, the Resources Planning and Scheduling Method (RPSM), utilizes a computer to handle resources. Three fictitious line networks designed to optimize manpower on three projects, worked out by RPSM, are presented. A table comparing the various systems is given. It is considered that the extensions of CPM have broader capability than those of PERT. F. R. L.

A65-23376
MARKOVIAN SEQUENTIAL DECISION PROCESSES.
Cyrus Derman (Columbia University, New York, N. Y.).
IN: STOCHASTIC PROCESSES IN MATHEMATICAL PHYSICS AND ENGINEERING; SYMPOSIUM IN APPLIED MATHEMATICS, 16TH, NEW YORK, N. Y., APRIL 30-MAY 2, 1963, PROCEEDINGS. [A65-23362 13-19]
Edited by Richard Bellman.
Symposium sponsored by the American Mathematical Society and the Society for Industrial and Applied Mathematics.
Providence, American Mathematical Society, 1964, p. 281-289. 20 refs.
Contract No. NR-042-099.

Formulation of minimization and optimization rules for Markov sequential decision processes of the type first discussed by Bellman; computational methods have been elaborated by several investigators, among them, Howard, d'Epenoux, Manne, Dantzig, and Wolfe. A dynamic stochastic system, observed at times $t = 0, 1, \ldots$, is classified into one of a finite number of states $0, 1, \ldots, L$. After each observation, the system is controlled by making one of a finite number of decisions $1, \ldots K$. The sequence of observations is denoted by $\{Y_t\}$, $t = 0, 1, \ldots$ and the sequence of decisions by $\{\Delta_t\}$, $t = 0, 1, \ldots$ It is assumed that $P(Y_{t+1} = j \mid Y_0, \Delta_0, \ldots, Y_t = i, \Delta_t = k) = q_{ij}(k)$, for $t = 0, 1, \ldots; i, j = 0, \ldots, L; k = 1, \ldots, K$, where the $q_{ij}(k)$'s are given nonnegative numbers such that $\sum_{j=0}^{L} q_{ij}(k) = 1$, $i = 0, \ldots, L; k = 1, \ldots, K$. W. M. R.

A65-23602 #
AUDIT - THE MEASURING TOOL OF QUALITY.
W. J. Flanagan (Martin Marietta Corp., Martin Co., Denver, Colo.).
IN: NEW DIMENSIONS IN SPACE TECHNOLOGY; SPACE CONGRESS, 2ND, COCOA BEACH, FLA., APRIL 5-7, 1965, PROCEEDINGS. [A65-23599 13-31]
Congress sponsored by the Canaveral Council of Technical Societies. Cocoa Beach, Canaveral Council of Technical Societies, 1965, p. 27-35.

Description of a quality audit operation that has been tested and proven to be an accurate barometer of quality effectiveness. The paper explains the organization of the audit unit as an integral part of the overall quality concept. The details of how a properly implemented audit is a reliable management tool for measuring quality competency are explained. The paper specifies why there is a need for an independent unit to continuously evaluate the total quality system. Methods that may be used to assure that problem areas are detected before they become significant failures are explained. The qualifications for competent auditors, as well as the four types of audits are defined. In addition, the various techniques for reporting the audit findings, evaluating the overall quality image, and assuring that adequate corrective action has been taken are discussed. The paper also briefly outlines the need for auditing certain operations outside the normal sphere of quality but nonetheless pertinent to quality requirements. This aspect of the paper deals with audits conducted to test the degree of compliance with established quality procedure, policies, and practices of the technical operations departments - i.e., engineering, procurement, logistic support. (Author) D.H.

A65-23604 #
VALUE CONTROL FOR SYSTEM DESIGN.
Ervin Leshner (Radio Corporation of America, Camden, N.J.).
IN: NEW DIMENSIONS IN SPACE TECHNOLOGY; SPACE CONGRESS, 2ND, COCOA BEACH, FLA., APRIL 5-7, 1965, PROCEEDINGS. [A65-23599 13-31]
Congress sponsored by the Canaveral Council of Technical Societies. Cocoa Beach, Canaveral Council of Technical Societies, 1965, p. 44-52. 6 refs.

Observations on the responsibilities of designers in terms of value control and cost effectiveness. Value and cost are controlled by the designer. Design decisions made so as to balance cost and performance will yield the greatest utility value to a system. Good value may be achieved by developing a cost model and a performance requirements model in detail sufficient to permit tradeoffs to be made by the designer. (Author) D.H.

A65-23610 #
PREDICTION ANALYSIS AND MANAGEMENT DECISIONS.
Gilbert L. Roth and Carl R. Liebermann (NASA, Office of Manned Space Flight, Apollo Program Control Directorate, Performance Analysis and Control Group, Washington, D.C.).
IN: NEW DIMENSIONS IN SPACE TECHNOLOGY; SPACE CONGRESS, 2ND, COCOA BEACH, FLA., APRIL 5-7, 1965, PROCEEDINGS. [A65-23599 13-31]
Congress sponsored by the Canaveral Council of Technical Societies Cocoa Beach, Canaveral Council of Technical Societies, 1965, p. 130-151. 10 refs.

Discussion of the need in the Apollo program for accurate predictions of system weight, performance, power requirements, and other parameters. To meet this need and provide decision bases upon which to act, the Apollo Program Control Directorate of NASA Headquarters has under continuous development rigorous prediction analysis techniques (PAT) necessary to detect potential weaknesses before they become critical. This work is presently pointed toward predictions of space vehicle weight and performance as related to schedules, cost, and reliability. The prediction analysis technique described here combines applicable domains of classical statistical methods, relevancy devices, mathematical modeling, management decision criteria, electronic computer usage, hardware tradeoff, and error analyses. The techniques developed are not a cure-all, but are said to provide engineering and program managers with the data necessary to pinpoint critical issues, define courses of action, and thereby factually support technical and management judgments. (Author) D.H.

A65-23611 #
FUNCTIONAL FLOW DIAGRAMS - A NEW TOOL FOR ENGINEERING MANAGEMENT.
S. R. Hirsch.
IN: NEW DIMENSIONS IN SPACE TECHNOLOGY; SPACE CONGRESS, 2ND, COCOA BEACH, FLA., APRIL 5-7, 1965, PROCEEDINGS. [A65-23599 13-31]
Congress sponsored by the Canaveral Council of Technical Societies. Cocoa Beach, Canaveral Council of Technical Societies, 1965, p. 152-169.

Description of the preparation of functional flow diagrams which can provide technical managers with (1) a rapid comprehensive way of evaluating all the alternatives and the consequences of their decisions on the rest of the system, and (2) a means of assuring that all the requirements are satisfied. The illustrations are typical for a Manned Orbiting Laboratory (MOL) Program. The standard functional flow diagrams, required by AFSCM 375-5 (System Engineering Management Procedures) and prepared for the Titan II and Titan III programs, are of limited value because they tend to lag the conceptual and design efforts. The derivation of the new functional flow diagram - which starts where the traditional type ends - is described in some detail, and illustrations are given. D.H.

A65-23612 #
PLANNING AND MEASURING TECHNICAL PROGRESS.
J. B. Meyer (General Electric Co., Daytona Beach, Fla.).
IN: NEW DIMENSIONS IN SPACE TECHNOLOGY; SPACE CONGRESS, 2ND, COCOA BEACH, FLA., APRIL 5-7, 1965, PROCEEDINGS. [A65-23599 13-31]
Congress sponsored by the Canaveral Council of Technical Societies. Cocoa Beach, Canaveral Council of Technical Societies, 1965, p. 170-187.

Discussion of a methodology useful to planning and measuring (testing) progress toward the maturity of equipment, including sample visualizations useful to the program manager. The technique discussed provides a thorough assessment of a test program and enables gaps, omissions, or duplications to be easily visualized by a matrix-type approach. It highlights areas of criticality for management and enables resources to be allocated realistically for optimizing demonstrations by test. It also provides a measure of the risk associated with each test (thereby enabling replanning to spread the risk more evenly over a series of tests) and permits management to visualize the contribution of ground and flight tests to that risk. From the assessment described, it appears that other measures of value can be applied to each test as well as the measure of technical value. Modified approaches might include other influences, such as the cost per test, to obtain other parameters for measuring progress toward maturity. D.H.

A65-23613 #
MANAGEMENT AND THE MINUTEMAN.
Carl A. Jansen (USAF, Patrick AFB, Fla.).
IN: NEW DIMENSIONS IN SPACE TECHNOLOGY; SPACE CONGRESS, 2ND, COCOA BEACH, FLA., APRIL 5-7, 1965, PROCEEDINGS. [A65-23599 13-31]
Congress sponsored by the Canaveral Council of Technical Societies. Cocoa Beach, Canaveral Council of Technical Societies, 1965, p. 188-204. 7 refs.

Analysis of the key policies and procedures enacted at the various managerial levels during implementation of the Minuteman Program. The specific managerial levels examined are: system program management, corporate management, and field level management. The selection of these areas is justified on the basis of the present organizational structure which denotes these levels to be the key areas of the program. The key policy was the utilization of the Ballistic Systems Division as the primary management organization. This created greater control over all the contractor functions. In addition, the concurrency, cost-effectiveness, configuration control, and reliability standardization techniques contributed significantly to the program's success. The tools and concepts implemented in the Minuteman program are considered the forerunners of new approaches toward greater managerial efficiency. D.H.

A65-24154 #

A MULTIPLE-OBJECTIVE CHANCE-CONSTRAINED APPROACH TO COST EFFECTIVENESS.

A. Charnes (Teledyne, Inc.; Northwestern University, Evanston, Ill.), W. W. Cooper (Teledyne, Inc.; Carnegie Institute of Technology, Pittsburgh, Pa.), G. Kozmetsky, and L. Steinman (Teledyne, Inc.).

IN: NATIONAL AEROSPACE ELECTRONICS CONFERENCE, DAYTON, OHIO, MAY 11-13, 1964, PROCEEDINGS. [A65-24101 13-09]

Conference sponsored by the Professional Group on Aerospace and Navigational Electronics, Dayton Section of the Institute of Electrical and Electronics Engineers, and American Institute of Aeronautics and Astronautics.

Dayton, Institute of Electrical and Electronics Engineers, Dayton Section, 1964, p. 454, 455.

Discussion of considerations involved in planning the construction and development of major industrial aerospace facilities. The field of aerospace testing is treated in order to illustrate the problems involved in planning facilities. The competitive situation for companies developing new facilities is reviewed, and guides for aiding the selection and evaluation of new equipment and facilities are discussed. P.K.

A65-24155 #

SCOPE - MANAGEMENT VISIBILITY AND CONTROL SYSTEM.

W. Hochwald, W. D. Ashcraft, and B. U. Miller (North American Aviation, Inc., Autonetics Div., Anaheim, Calif.).

IN: NATIONAL AEROSPACE ELECTRONICS CONFERENCE, DAYTON, OHIO, MAY 11-13, 1964, PROCEEDINGS. [A65-24101 13-09]

Conference sponsored by the Professional Group on Aerospace and Navigational Electronics, Dayton Section of the Institute of Electrical and Electronics Engineers, and American Institute of Aeronautics and Astronautics.

Dayton, Institute of Electrical and Electronics Engineers, Dayton Section, 1964, p. 463-478.

Description of the SCOPE (from Schedule, Cost, and Performance) computer-aided management system for the budget and schedule control of complex research and development programs. The system uses a computer to combine, assess, and summarize information from various organizational levels to provide data which account for the schedule, cost, and performance of all work units. The SCOPE output, in the form of reports, summaries and graphs, enables management to rapidly recognize cost, schedule, and organizational-interface problems. Project summaries are used to indicate where corrective action can be applied both by line supervision and program management. P.K.

A65-25153

METHODOLOGY OF SYSTEM ENGINEERING.

Robert E. Machol (Illinois, University, Dept. of Systems Engineering, Chicago, Ill.).

IN: SYSTEM ENGINEERING HANDBOOK.
Edited by R. E. Machol, W. P. Tanner, Jr., and S. N. Alexander. New York, McGraw-Hill Book Co., 1965, p. 1-3 to 1-13. 11 refs.

A general survey of system engineering, its definition, structure, viewpoint, and functions. A system is defined as having the following seven characteristics: it is manmade, it is integral, large, complex, semiautomatic, competitive, and its input is stochastic - i.e., the exact load or performance at any instant cannot be predicted. The problem of system structure can be broken down into the chronological phases of system design, the logical steps involved, the mathematical and scientific tools used, the functional parts of a system, and the administratively designated subsystems of a system. The basic viewpoint relative to system engineering is optimization of the cost-effectiveness ratio of the overall system; construction of a mathematical model is of great importance in the technique of optimization, based on "operations research," which involves the necessity of establishing and defining a quantitative measure of effectiveness. The ability to examine a problem, define such a quantitative measure, and then write equations based on the parameters of the particular case being analyzed are a measure of the competence of a system engineer, whose background should be broad but also deep in either mathematics or engineering. D.P.F.

A65-25174

DECISION THEORY.

George R. Cooper (Purdue University, School of Electrical Engineering, Lafayette, Ind.).

IN: SYSTEM ENGINEERING HANDBOOK.
Edited by R. E. Machol, W. P. Tanner, Jr., and S. N. Alexander. New York, McGraw-Hill Book Co., 1965, p. 24-1 to 24-31. 14 refs.

A discussion of decision theory as applied to the theory of engineering systems. In one class, the system is required to make a choice among several alternatives, and it must perform this function on the basis of unreliable information. The distinguishing characteristics of such systems is that they must produce an unequivocal answer that is either exactly right or completely wrong. The nature of the mathematical operation involved in applying statistical decision theory to system evaluation, optimization, and comparison is analyzed and discussed. The application of decision theory to signal detection is described, wherein the decision-theoretical formulation of signal extraction is based on the average risk, and two simple examples are given of the decision-theoretical approach to parameter estimation. Adaptive, learning, and recognition systems are discussed. D.P.F.

A65-25176

ELEMENTS OF A STRATEGY FOR MAKING MODELS IN LINEAR PROGRAMMING.

A. Charnes (Northwestern University, Evanston, Ill.) and W. W. Cooper (Carnegie Institute of Technology, Pittsburgh, Pa.).

IN: SYSTEM ENGINEERING HANDBOOK.
Edited by R. E. Machol, W. P. Tanner, Jr., and S. N. Alexander. New York, McGraw-Hill Book Co., 1965, p. 26-1 to 26-30. 44 refs.

A description of the techniques applicable to the construction of models in linear programing, with particular application to management and social science. The need for distinguishing between a problem and the way it might be modeled is stressed, as, for example, in the search for intersections between the wanted solutions of a nonlinear problem and a linear model constructed to deal with it. Model equivalents that can be obtained by effecting various transformations are discussed. These transformations, together with the properties of a constrained optimization, can be used to obtain still further extensions - for example, when obtaining the replacement of a compound objective with a simpler objective, in order to deal with a larger problem in engineering design. Techniques for characterizing the rank of a matrix, applying duality to linear programing, using constrained regressions for algorithmic completion, and extending the simplex method to algorithmic alterations are described. D.P.F.

A65-25180

HUMAN INFORMATION-PROCESSING CONCEPTS FOR SYSTEM ENGINEERS.

Richard W. Pew (Michigan, University, Dept. of Psychology, Human Performance Center, Ann Arbor, Mich.).

IN: SYSTEM ENGINEERING HANDBOOK.
Edited by R. E. Machol, W. P. Tanner, Jr., and S. N. Alexander. New York, McGraw-Hill Book Co., 1965, p. 31-3 to 31-19. 49 refs.
Contract No. AF 49(638)-1235.

An investigation of a point of view or philosophy for including human operators in systems and some applications of this viewpoint. Recent developments in the study of human performance and the accumulating experience of human-factors designers suggest that an important unifying concept for the design of man-machine systems lies in the view of man as a single-channel, limited-transmission-capacity, information-processing system. This view regards man as an information channel in the cybernetic sense rather than as an energy converter or power supply. The human information-processing system has been broken down into four subsystems: read-in, memory or storage, information processing or decision making, and read-out. These four human subsystems are analyzed, followed by a discussion of integrated system operation. Human capabilities are discussed in terms of system requirements and concepts. D.P.F.

A65-25184

ECONOMICS.

Kenneth E. Boulding (Michigan, University, Ann Arbor, Mich.).

IN: SYSTEM ENGINEERING HANDBOOK.

Edited by R. E. Machol, W. P. Tanner, Jr., and S. N. Alexander. New York, McGraw-Hill Book Co., 1965, p. 35-1 to 35-8.

An investigation of the relationship of the science of economics to system engineering. The economist's function is twofold: (1) to evaluate the internal standards by which any particular design or project shall be judged and (2) to decide whether any particular project shall be executed or not. Both involve an ordering of alternatives by a set of ordinal numbers such as "best," "second best," and "third best." The economist, in defining the criterion of economic efficiency, must reduce the manifold inputs and outputs (of varying dimensions) to a common measure, by means of a set of evaluation coefficients. In order to determine the latter, rates of return, marginal analysis, price structure, productivity, aggregate-product and income concepts, and inflation and deflation are all factors which must be analyzed. The text includes considerations relative to these factors. Engineering projects planning is discussed. D.P.F.

A65-25511

JUSTIFICATION OF COMPUTER USE BY A SMALL AIRCRAFT COMPANY.

J. F. Morehead (Rockwell-Standard Corp., Aero Commander Div., Bethany, Okla.).

IN: SOCIETY OF AUTOMOTIVE ENGINEERS, BUSINESS AIRCRAFT CONFERENCE, WICHITA, KAN., MAY 6-8, 1965, PROCEEDINGS. [A65-25495 15-02]

New York, Society of Automotive Engineers, 1965, p. 163-167.

Use of a computer to reduce calibration data, to keep the history of the calibrations of all test indicators that do not have linear calibration curves, and to process static test data. In addition to direct money savings, it is considered that the principal benefit of the computer is the speed with which answers are obtained. The computer has also greatly facilitated the solution of aerodynamic, propulsion, and lofting problems. It is pointed out that a further benefit is confidence that the answers are 99.99+% correct, whereas a man's accuracy is at best 95%. F.R.L.

A65-26054

REAL TIME RELIABILITY VIA O.R. TECHNIQUES.

Arthur A. Dauch (Hughes Aircraft Co., Space Systems Div., Systems Engineering Dept., El Segundo, Calif.) and Walter R. Kuzmin (Hughes Aircraft Co., Aerospace Group, Space Systems Div., Reliability Section, El Segundo, Calif.).

IN: ACTIVE RELIABILITY; ANNUAL WEST COAST RELIABILITY SYMPOSIUM, 6TH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CALIF., FEBRUARY 20, 1965. [A65-26051 15-15]

Symposium sponsored by the Reliability Div. of the Los Angeles Section, American Society for Quality Control, and the College of Engineering and University Extension, University of California. North Hollywood, Western Periodicals Co., 1965, p. 49-64.

Decision-making in a typical spacecraft program having high reliability requirements. Constraints of the program, such as development to tight schedules, use of current technology, weight, new environments (space vacuum), complexity, and diversification of controls are described. Major elements of such programs are the fundamental resolution of failures when they occur and provision of visibility so that actions may be taken to avoid failures. The discussion is limited to the decision-making actions pertaining to the failure-reporting aspect of a spacecraft reliability program. F.R.L.

A65-26056

SMALL SUPPLIER RELIABILITY CONTROL.

W. W. Harter and P. Sitzer (Northrop Corp., Norair Div., Hawthorne, Calif.).

IN: ACTIVE RELIABILITY; ANNUAL WEST COAST RELIABILITY SYMPOSIUM, 6TH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CALIF., FEBRUARY 20, 1965. [A65-26051 15-15]

Symposium sponsored by the Reliability Div. of the Los Angeles Section, American Society for Quality Control, and the College of Engineering and University Extension, University of California. North Hollywood, Western Periodicals Co., 1965, p. 77-93.

Outline of the requirements established by Northrop Corporation's Norair Division for control of product reliability by small suppliers. Experience with small suppliers in trying to implement these requirements with no increase in cost is reviewed. It is considered that reliability control requirements must include (1) systematic reliability design reviews, (2) parts-selection policy implementation, (3) reliability testing, and (4) failure-mode analysis and corrective-action system. F.R.L.

A65-26062

A MANAGEMENT TECHNIQUE FOR ASSURING RELIABILITY CONTRACT PERFORMANCE.

John F. Beau (North American Aviation, Inc., Autonetics Div., Downey, Calif.).

IN: ACTIVE RELIABILITY; ANNUAL WEST COAST RELIABILITY SYMPOSIUM, 6TH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CALIF., FEBRUARY 20, 1965. [A65-26051 15-15]

Symposium sponsored by the Reliability Div. of the Los Angeles Section, American Society for Quality Control, and the College of Engineering and University Extension, University of California. North Hollywood, Western Periodicals Co., 1965, p. 179-188.

Description of a technique for assuring reliability contract performance based on budgeting and measurement concepts. An example chart is presented and analyzed. The technique is considered to have certain advantages, such as (1) a simple single-page "snapshot" of quality performance as related to hardware, (2) results expressed in terms of escape defects which are directly related to reliability budgets, (3) a measure of inspection performance as well as manufacturing performance, (4) an objective basis for determining whether quality-control or manufacturing personnel should take corrective action, (5) performance of corrective action at a point in time which prevents catastrophic field problems at a later date, (6) easily verifiable corrective action, and (7) low cost. F.R.L.

A65-27269

CURRENT FINANCIAL CONSIDERATIONS IN AIRLINE AIRCRAFT ACQUISITIONS.

J. P. Mitchell (Chase Manhattan Bank, New York, N.Y.).

Society of Automotive Engineers, National Aeronautic Meeting and Production Forum, Washington, D.C., Apr. 12-15, 1965, Paper 650244. 5 p.

Members, $0.75; nonmembers, $1.00.

Appraisal of airline equities by the financial market. Better profits, an improved stock-market image, and the health of the general economy are said to be the outstanding financial considerations today. Other aspects include the benefits of investment tax credits and the continuing opportunity to benefit therefrom, with substantial purchase commitments running into 1968 and 1969. Possibilities of leasing are receiving greater consideration, and the procedure has certain advantages, as well as disadvantages. Financing assistance by manufacturers is evidence of the strong competition in a buyers' market. A continuing strong economy is considered to be the key to airline realization of potential heavy cash flow adequate to service the sizeable purchase commitments. (Author) F.R.L.

A65-29203

LOCS - AN EDP MACHINE LOGIC AND CONTROL SIMULATOR.

M. S. Zucker (International Business Machines Corp., Yorktown Heights, N.Y.).

IEEE Transactions on Electronic Computers, vol. EC-14, June 1965, p. 403-416.

Description of the new EDP Machine Logic and Control Simulator, LOCS, which is designed to facilitate the simulation of data processing systems and logic on the IBM 7090 Data Processing System. With this simulator, it will be possible to operate and execute commands in a manner comparable to that of a hardware version of the machine being simulated. The inputs to LOCS consist of a description, coded in LOCS language, of the machine to be simulated and a set of test programs coded in either the procedure language of the test problems - e.g., Fortran - or in the instruction language of the simulated machine. If a procedure language is used, a suitable translator program coded in machine language must be included to translate the test programs into machine code. The outputs of LOCS consist of the performance statistics, computation results, and diagnostic data which are relevant to both the test programs and the design of the simulated machine. The LOCS System is described, and a description of LOCS inputs and outputs is included with an outline of the procedure to be followed when using LOCS. The method of using LOCS is illustrated by an example of the complete simulation of a simple conventional binary data processing machine, and the current status is summarized. (Author) M.F.

A65-29269 #
PROGRAM MANAGEMENT - IN THEORY AND IN PRACTICE.
David I. Cleland (USAF, Air University, Institute of Technology, Wright-Patterson AFB, Ohio).
IN: NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 17TH, DAYTON, OHIO, MAY 10-12, 1965, PROCEEDINGS. [A65-29228 18-09]
Conference sponsored by the Professional Group on Aerospace and Navigational Electronics, Dayton Section of the Institute of Electrical and Electronics Engineers, and American Institute of Aeronautics and Astronautics.
Dayton, Institute of Electrical and Electronics Engineers, Dayton Section, 1965, p. 334-338. 13 refs.

Discussion of program management, an approach to organizational theory that has no organizational or departmental constraints. The idea of program management centers around the control and integration of large aggregations of resources which are outside the traditional flows of authority and responsibility. The role played by this philosophy in the defense industry-government complex is examined. S.H.B.

A65-29270 #
AN APPROACH TO RESEARCH AND DEVELOPMENT EFFECTIVENESS.
A. B. Nutt (USAF, Systems Command, Research and Technology Div., Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio).
IN: NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 17TH, DAYTON, OHIO, MAY 10-12, 1965, PROCEEDINGS. [A65-29228 18-09]
Conference sponsored by the Professional Group on Aerospace and Navigational Electronics, Dayton Section of the Institute of Electrical and Electronics Engineers, and American Institute of Aeronautics and Astronautics.
Dayton, Institute of Electrical and Electronics Engineers, Dayton Section, 1965, p. 339-345. 5 refs.

Description of the Research and Development Effectiveness (RDE) computerized planning program, designed to utilize analytical techniques in the management of research and development resources in the Air Force Flight Dynamics Laboratory. The concept of a mission matrix, expressing the technical needs of the Air Force, is introduced, and the mathematical model of the RDE program is developed. S.H.B.

A65-29683 #
DECISION TOOLS FOR COST-EFFECTIVE DESIGN.
E. S. Winlund (System Technology Services, San Diego, Calif.).
American Institute of Aeronautics and Astronautics, Annual Meeting, 2nd, San Francisco, Calif., July 26-29, 1965, Paper 65-391. 12 p. 8 refs.
Members, $0.50; nonmembers, $1.00.

Advantages of continuous evaluation methods based on the customer's criteria for the development of complex proprietary products, competitive proposals in response to RFPs, and technical guidance during hardware design. On completion of the "first pass" at a design, alternative hypothetical designs are developed for different performance capabilities. Each such design is then modified for higher reliability and maintainability. For each combination, effectiveness (performance x availability x delivery effectiveness) is plotted against its useful lifetime cost (initial and operational), and the resulting curves used for design decisions. A real computer example shows that optimal MTBF is about six times that obtained with "normal" reliability programs. A real space station example shows that, to pay off, not more than 26.6 lb may be added for each percent of reliability improvement. An evaluation and reporting system is outlined, to permit design supervision to watch cost-effectiveness trends throughout design. (Author) F.R.L.

A65-29709 #
SYSTEM EFFECTIVENESS ASSURANCE MANAGEMENT.
Leslie W. Ball (Boeing Co., Aero-Space Div., Seattle, Wash.) and Weston H. Price (Boeing Co., Seattle, Wash.).
American Institute of Aeronautics and Astronautics, Annual Meeting, 2nd, San Francisco, Calif., July 26-29, 1965, Paper 65-390. 12 p.
Members, $0.50; nonmembers, $1.00.

Description of the system effectiveness assurance management system as developed by the Weapon System Effectiveness Industry Advisory Committee. The evolution of product assurance up to the time that the USAF established this committee is summarized, and reasons for its establishment are given. It is concluded that integration of all types of assurance into a single system can provide important simplifications in organization and in buyer-seller relationships, and result in considerable economies in both customer and contractor operations. B.B.

A65-29876
MANAGEMENT TECHNIQUES IMPROVE PRODUCT RELIABILITY
L. G. C. Peirce (Martin Marietta Corp., Martin Co., Denver, Colo.).
Tool and Manufacturing Engineer, vol. 55, July 1965, p. 41, 42.

Discussion of an evaluation program, designed to place the responsibility for quality on the supplier. The program continuously evaluates supplier performance, with the acceptable maximum rejection rate of 2% of the total number of received parts. Two of the major results of the program are that the percent of rejections is found to diminish and that the risk of latent defects is minimized. M.L.

A65-31140
A PROPOSED MILITARY STANDARD "AUTOMATICALLY PROCESSED WIRING DATA AND DIAGRAMS."
F. Glenn Fielding (North American Aviation, Inc., Los Angeles, Calif.).
(1965 Aerospace Technical Conference and Exhibit, Houston, Tex., June 21-24, 1965, Paper.)
IEEE Transactions on Aerospace, vol. AS-3, June 1965, Supplement, p. 583-597.

Consideration of the value, feasibility, and means of adopting standard computer-processed lists of wiring data and diagrams. The basic principles, function, and requirements of automatic data processing are explained and related to wire lists and diagrams. The functions that computers can fulfill in this area are explained and evaluated. The necessity and means for establishing a standard industrial system are discussed. Flow and activity charts for such a system are given. R.A.F.

A65-31577 #
SYSTEM SAFETY - LEGAL ASPECTS.
J. Paul Cole (Holman, Marion, Perkins, Cole and Stone, Seattle, Wash.).
IN: SYSTEM SAFETY SYMPOSIUM, SEATTLE, WASH., JUNE 8-10, 1965, PROCEEDINGS. [A65-31568 20-34]
Symposium sponsored by the University of Washington and the Boeing Co.
Seattle, Boeing Co., 1965. 19 p.

Examination of the implications of the rapid obliteration of the "privity" requirement in actions against manufacturers for breach of warranty resulting in injury or damage to consumers or users. An analysis of recent decisions is considered to show that manufacturers of mechanical systems such as aircraft are subject to the same rulings as manufacturers of food and beverages. Some ways and means which have been employed to hold a manufacturer liable for a defective product (other than tort action) are cited to show that consumer protection has been deemed an essential element of public policy. For his own protection, it is considered that the manufacturer must maintain the highest standards of design and quality control. F.R.L.

A65-31586 #
MANAGEMENT ASPECTS OF AERO-SPACE SYSTEM SAFETY ENGINEERING.
Harold D. Trettin (Boeing Co., Aero-Space Div., Seattle, Wash.).
IN: SYSTEM SAFETY SYMPOSIUM, SEATTLE, WASH., JUNE 8-10, 1965, PROCEEDINGS. [A65-31568 20-34]
Symposium sponsored by the University of Washington and the Boeing Co.
Seattle, Boeing Co., 1965. 13 p.

Description of a model system safety program and discussion of the role of management in aerospace system safety. To implement its tasks in this field, it is suggested that management should define the objectives for the safety field, specify the tasks to be completed, provide an organization structure and command media, and provide the resources required to implement the program. Basic objectives in the training of system safety personnel are also described. S.H.B.

A65-31817 #

COST EFFECTIVENESS OPTIMIZATION DURING SYSTEM DEFINITION AND DEVELOPMENT.

John A. Lockerd (Bell Aerospace Corp., Bell Helicopter Co., Fort Worth, Tex.).

IN: AMERICAN HELICOPTER SOCIETY, ANNUAL NATIONAL FORUM, 21ST, WASHINGTON, D. C., MAY 12-14, 1965, PROCEEDINGS. [A65-31806 20-02]

New York, American Helicopter Society, 1965, p. 131-140.

Discussion of the role of system analysis and cost-effectiveness optimization during system definition and development phases. Emphasis is placed on optimization methodology. The methodology developed provides, by iterative processes, system cost and performance values resulting from alternative subsystem/system configurations in the specified environment. Since system objectives must be based on the environment and required performance determined by mission cost effectiveness, the methodology is equally applicable to any military or commercial application. Its continued use through the design and development phase as a management tool for configuration management, change control, and weight control is also illustrated. (Author) B.B.

A65-33159

OPERATIONAL RESEARCH AND AVIATION MANAGEMENT. I - AN INTRODUCTION TO OPERATIONAL RESEARCH.

R. R. P. Jackson and P. A. Longton (Business Operations Research, Ltd., London, England).

Royal Aeronautical Society, Journal, vol. 69, Aug. 1965, p. 543-552.

Demonstration of the power of the operational research approach both in general and in particular, with some examples relative to the aviation industry. It is shown that the key to operational research is the scientific method, moving logically through the phases of assumption, analysis, tests, and predictions. By the intuitional development of a model, followed by the application of a Poisson distribution, a detailed operational research approach is presented. F.R.L.

N65-10381# Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

NEW ELECTRONIC COMPUTERS FOR ENGINEERING AND PLANNED-ECONOMY CALCULATIONS

V. I. Loskutov 22 Sep. 1964 10 p Transl. into ENGLISH from Stanki i Instrument (USSR), no. 1, 1964 p 26-28

(FTD-TT-64-631/1+2+4; AD-607122)

The domestic industry has developed and is producing new digital computers Minsk-2 and Promin' to perform planned-economy calculations, and deal with scientific and engineering problems. Applications of these machines in scientific research and construction organizations are promoting a significant expansion in the area of theoretical research, and they are helping to perform complex engineering calculations. The use of electronic computers for economic analysis and planning makes feasible a scientific approach to questions determining the economy in heavy industry regions and plants. The Minsk-2 provides automatic programing for program-controlled machine tools. Author

A65-36531

ESSENTIALS OF SOFTWARE.

Noble S. Bishop (Northrop Corp., Nortronics Div., Anaheim, Calif.).

IN: AUTOMATIC SUPPORT SYSTEMS SYMPOSIUM FOR ADVANCED MAINTAINABILITY, ST. LOUIS, MO., JUNE 7-9, 1965, PROCEEDINGS. [A65-36515 24-08]

St. Louis, Mo., Institute of Electrical and Electronics Engineers, St. Louis Section, 1965, p. 5A-1 to 5A-7.

Definition of software in its relation to automatic checkout so that real costs can be recognized. Approaches through technology and application of skills are described which can reduce costs. The true scope of software as dictated by practical necessity and contractual convenience is explained, and the processes involved in its creation are developed. The application of electronic data processing to the preparation of checkout systems is amplified. The system approaches of the Test Oriented Software System (TOSS) concept are introduced and their impact is described. The automatic checkout systems referred to are part of the Nortronics DATICO (Digital Automatic Test Intelligence Check Out) family. Current systems are perforated 8-bit tape-controlled systems. Both real time monitoring (on-line) and maintenance (off-line) systems are included. F.R.L.

N65-10522# General Dynamics Corp., Groton, Conn. Electric Boat Div.

BEHAVIORAL AND OPERATIONAL ASPECTS OF TACTICAL DECISION MAKING IN AAW AND ASW

Raymond C. Sidorsky, Joan F. Houseman, and David E. Ferguson Port Washington, N.Y., Naval Training Device Center, Aug 1964 112 p refs

(Contract N61339-1329)

(NAVTRADEVCEN-1329-1; AD-607888)

This report describes a continuing analytical and empirical research program intended to provide data related to those aspects of decision-making behavior that can be trained. The study included the delineation of the organization and responsibilities of AAW and ASW personnel as well as the development of ACADIA—a taxonomy of tactical decision tasks. Purposes to be served by the ACADIA schema include the isolation and identification of general decision-making skills and the development of training procedures and methods through which general decision-making skills can be developed. Several behavioral traits are discussed in regard to their applicability to the derivation of generalized behavioral criteria. These traits include stereotypy, perseveration, timeliness, completeness, and series consistency. Also discussed is the notion of a Decision Response Evaluation Matrix, a technique that might make it possible to rate or score the adequacy of a decision response in terms of various operational criteria such as spatial relationships, self-concealment, conservation of resources, information generation, and weapon utilization. Author

N65-10766# Joint Publications Research Service, Washington, D.C.

SOLUTION OF THE PROBLEM OF MINIMIZATION OF DEVELOPMENT COST IN ANALOG MODELS

M. V. Rybashov and Ye. Ye. Dudnikov *In its* Tech. Cybernetics, No. 4, 1964 10 Nov. 1964 p 128-145 refs (See N65-10754 01-19) OTS: $6.00

Possible realizations of the PERT cost procedures are realized in an analog electronic model. A graph is developed for the cost dependencies of the optimal plan for its duration; for each point of this graph, parameters are defined for the corresponding network of the optimal plan. For decreasing the volume of the solved problem it is proposed that one problem be divided into two with a fewer number of variables and that several parts of the planned network be replaced by new individual operations. The discussion is illustrated by examples. Author

N65-11099# Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

AUTOMATION TODAY AND TOMORROW Collection of Articles

D. M. Berkovich et al 20 Oct. 1964 58 p ref Transl. into ENGLISH from "Avtomatizatsiya Segodnya i Zavtra" Moscow, Izd. Znaniye, 1963, ser. 4 p 1-40

(FTD-MT-64-188; AD-607856)

This is a discussion of the first volume of the encyclopedia "Automation of Production and Industrial Electronics." The development of the cybernetic technology as an important prerequisite of new technical and scientific approaches to liberate mankind from dehumanization by machines is emphasized. The following topics are presented: "Main Trends in the Development of Automation"; "Arming Personnel with Advanced Science"; "Some Problems of Radio Electronics"; "Creative Collaboration of Engineers and Biologists"; "Persistently Develop the Theoretical Bases of Automation"; "Electronic Technology at the Service of Automation"; and "Mathematical Problems of the Organization of Production." G.G.

N65-11378*# National Aeronautics and Space Administration, Washington, D. C.
MANAGEMENT REQUIREMENTS FOR SPACE EXPLORATION
Robert C. Seamans, Jr. [1964] 9 p Presented to the Apollo Luncheon, Natl. Aeron. and Space Eng. Meeting, Sae, Los Angeles, 8 Oct. 1964

The problem of uneconomic use of human and financial resources in the space program caused by schedule slippages in R&D contracts is discussed at length. It is stated that R&D must be controlled. Some of the approaches to this desirable control are mentioned, such as the use of incentive contracts wherever possible, improved quality control, extensive environmental testing, better task specifications, and the use of sound reporting methods, such as PERT. Several specific aspects of the problem of controlling R&D programs are discussed, and Mr. Seamans' personal views of the future trends in space program contracting are given. D.E.W.

N65-11772# Air Force Systems Command, Wright-Patterson AFB, Ohio Aerospace Medical Research Labs.
TEST AND EVALUATION OF QUALITATIVE AND QUANTITATIVE PERSONNEL REQUIREMENTS INFORMATION
Evan D. Stackfleth Sep. 1964 26 p refs
(AMRL-TDR-64-65; AD-607781)

Some of the problems in the validation of personnel requirements developed and predicted in the Qualitative and Quantitative Personnel Requirements Information reports are described. Included are problems inherent in the validation procedures, such as the nature of the predictor (QQPRI), the problem of criterion selection and bias, and the changing nature of the criterion. Because of the multiple nature of these problems, available testing techniques are not adequate to handle the testing and to provide desired information. A solution is presented. This solution requires a procedural change whereby validations are conducted during different but specific stages of system development and test. The validations would be oriented to obtaining the best validation at a particular time and for a particular purpose rather than attempting an overall test. Methods are suggested for determining manning deficiencies and readjusting the personnel subsystem. Author

N65-12582# Aerospace Corp., San Bernardino, Calif. Computation and Mathematics Center
RELIABILITY COST/EFFECTIVENESS: A PILOT STUDY Final Report
S. H. Brooks Jun. 1964 42 p refs
(Contracts AF 04(695)-269, AF 04(695)-469)
(BSD-TDR-64-91; TDR-269(S4853)-1, AD-451906)

A mathematical model is developed and explored to examine the overall relationship between the effectiveness—in terms of reliability, availability, and maintainability—and the costs to be allocated and apportioned among the reliability efforts. This model leads to an estimate of how much should be spent on reliability during design and development of a missile system, and how much should be spent in ensuring the reliability and availability for each individual missile during its operational life. A computer program was developed, and parameter studies along these lines were initiated. Requisite optimization and information methods are discussed. Preliminary indications are that cost–effectiveness modeling is feasible and leads to methods of program control. Author

N65-12666# Joint Publications Research Service, Washington, D.C.
ELECTRONIC CONTROL COMPUTERS
15 Dec. 1964 34 p Transl. into ENGLISH from Electrotekh. (Moscow), no. 7, Jul. 1964 p 1-10
(JPRS-27848; TT-64-51942) OTS: $2.00

A paper on the automation of production control by means of electronic computer engineering considers the structure and functioning of automatic control systems, plant information structure, savings of the system, and requirements for the introduction of automatic production-control systems. A second paper considers a universal solid-state digital control computer and system of automatic data processing, called VNIEEM-1. The computer may be used for control of different industrial processes, for automatic data processing, and for numerical analysis. An overall description of the computer is given, and the individual functional units, such as printout, ferrite-core memory unit, adder, etc., are discussed. Operations, information format, representations of information, and other aspects of machine function are given, and a table displays the specifications of the computer. D.E.W.

N65-13955# Gt. Brit. Dept. of Scientific and Industrial Research, Warren Spring Lab.
HUMAN SCIENCES IN INDUSTRY. PART I: ERGONOMICS Annotated Bibliography
Sep. 1964 133 p refs

Included are abstracts of studies reported on in a variety of domestic and foreign professional journals, in conference proceedings, and in other documents. Categories cover ergonomics; systems of men and machines; visual inputs and processes; auditory inputs and processes; other sensory inputs and processes; input channels—choice and interaction; body measurements, basic physiological capacities, basic and complex motor performance; design of controls and integration with displays; layout of panels and consoles; design of work space, equipment, and furniture; clothing and personal equipment; special environmental factors affecting performance; individual factors, work conditions, and task characteristics that affect behavioral efficiency; training aids and devices and their use; personnel psychology and social psychology relevant to ergonomics. R.I.K.

N65-13982# Union Carbide Nuclear Co., Oak Ridge, Tenn. Operations Analysis Div.
CRITICAL PATH SCHEDULING WITH RESOURCE LEVELING ON THE IBM-7090
W. A. Gray and E. M. Kidd 20 Mar. 1964 68 p refs
(Contract W-7405-ENG-26)
(K-1499) OTS: $1.50

This report contains a description of a program written to do the computation required in the application of the critical-path scheduling method. The basic critical-path parameters, a network expansion, a resource leveling feature, and the types of output are described. Author

N65-14050# Mitre Corp., Bedford, Mass.
USER'S MANUAL FOR THE COMPUTERIZED ELECTRONIC SYSTEM COST MODEL
T. J. Jannsen, H. Glazer, and J. C. Des Roches Oct. 1964 133 p refs
(Contract AF 19(628)-2390)
(ESD-TDR-63-446; TM-03651; AD-608057)

This document describes the initial version of a computerized electronic system cost model and gives instructions for the electronic data processing procedures, including presentation of the key punch input forms, computer output formats, and a description of the computer program logic. The model, currently operational, was programed for the IBM 7090 computer, and requires a 32768 register core memory. The objectives of this manual are to provide a primer for the cost analyst, and a reference manual for the detailed operations on the use of the model. Author

N65-14156# Joint Publications Research Service, Washington, D.C.

THE EFFECTIVENESS OF USING COMPUTERS IN PLANNING

M. Koukolik 4 Jan. 1965 13 p Transl. into ENGLISH from Khim. i Neft. Mashinostr. (Moscow), no. 3, Sep. 1964 p 9-13 (JPRS-28099; TT-65-30038) OTS: $1.00

Various computer programs were formed for the problems of automation processes, shops, plants, and enterprises in the chemical industry. The construction difficulty of automatic control systems increased in proportion to the complexity of the production flow diagram. The computer calculations and manual methods are compared, and the savings in time and expenditures are presented in a profile. It was concluded that calculations requiring expenditures for programing are only economical in the case of frequent and repeated use, because program obsolescence is inevitable after 3 years. A statistical analysis of the use of an electronic computer for design applications in comparison with a manual method showed that the quality of technical solutions increased and that the capital expenditures were lowered. G.G.

N65-15188*# Washington U., St. Louis, Mo.

PRODUCT MANAGEMENT FOR DEFENSE/SPACE MARKETS

Murray L. Weidenbaum [1964] 10 p refs Presented to Am. Marketing Assn., Chicago, 29 Dec. 1964

(Grant NsG-342)

(NASA-CR-60227) OTS: HC $1.00/MF $0.50

The defense-space market is an area of industry where, although an identifiable activity labeled product management generally does not exist, the function of product management may be of unparalleled importance. This paper describes the unique characteristics of the military-space market and the unusual distribution of effort within the overall marketing function. Because of the extremely rapid rates of product innovation and product obsolescence, the management decisions critical to the existence and growth of the military-oriented company relate to the composition of its future product line. Author

N65-16071# Air Force Systems Command, Bedford, Mass. Electronic Systems Div.

THE DECISION SCIENCES LABORATORY PROGRAM OF TECHNIQUES AND FACILITIES FOR AUTOMATING RESEARCH

Emir H. Shuford, Jr. Sep. 1964 48 p refs

(ESD-TDR-64-553; AD-608421)

This is a report on the application of techniques and the use of computer facilities in automating research in the Decision Sciences laboratory. Applications are divided into six categories: (1) real-time control of experimental tasks performed by human subjects, (2) statistical analysis of experimental data, (3) stimulation and sensitivity analyses, (4) studies in information retrieval, (5) techniques for improving the man-computer interface, and (6) computer-based personnel selection, classification, training, and proficiency testing. Examples are given of each application. There is also a detailed facility layout and description of equipment characteristics. Author

N65-16928# System Development Corp., Santa Monica, Calif.

COMMAND RESEARCH LABORATORY: INTRODUCTION TO THE TIME-SHARING SYSTEM

Jules I. Schwartz 14 Sep. 1964 25 p refs

(SP-1722/000/00; AD-451862)

A time-sharing system was developed to permit parallel running of computer problems of the on-line, man-machine, interactive variety. In this system, all programs requested by the users are stored on an assigned section of the drum until the user quits. A program is given one quantum of time to operate, which represents the maximum time for one operating cycle. The program's turn ends when it requests an input-output transfer, when the quantum of time ends, or when an error condition arises. When the turn ends, the controlling program entitled "Executive System," determines if another program is ready to operate and, if so, brings it to the core. The "Executive System" resides permanently in 16 000 registers of core and has the following major functions. (1) It takes required action to all computer interrupts. (2) It interprets inputs and commands from teletypes and typewriters. (3) It allocates both core and peripheral storage, performs all input-output, schedules the running of objects programs, and performs a number of on-line debugging services. D.S.G.

N65-17234# Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering

AN EXECUTIVE PROGRAM FOR MULTIPLE CONSOLES

Interim Technical Report

N. S. Prywes and D. H. Miller 25 Mar. 1964 30 p ref

(Contract Nonr-551(40))

(Rept.-64-13; AD-600979)

A revision of the Naval Aviation Supply Office IBM 1410 data processing system is specified (1) to permit the computer to be controlled through the use of a set of remote input-output stations with the same accuracy as that attained by controlling it through the main console, and (2) to require the presentation of all requests in a nine-part flexible input format. The hardware consists of an IBM 1410 central computer with 16 servos, a card read-punch, a console, six IBM 1014 remotes, and two IBM 1301 disks. R.L.K.

N65-17310# Joint Publications Research Service, Washington, D.C.

CYBERNETICS—PHILOSOPHICAL AND SOCIOLOGICAL PROBLEMS

I. Novik 20 Jan. 1964 217 p refs Transl. into ENGLISH of the book "Kibernetika—Filosofskiye i Sotsiologicheskiye Problemy" Moscow, State Political Lit. Publishing House, 1963 p 1-207

(JPRS-22814; OTS-64-21340) OTS: $3.50

Social, scientific-technical, and theoretical conditions led to the emergence of the new science of cybernetics. This new science is characterized by a generic and abstract approach to control with the aid of a signaling action. This distinguishes it from automatic control, effected in the past, to presuppose direct mechanical communications, nexus and contact. Cybernetics is directly bound to optimization. An analysis of the interrelationship of man and machine led to the conclusion that the use of cybernetic machines will contribute to raising the cultural-technical level of mankind. G.G.

N65-17511*# Douglas Aircraft Co., Inc., Huntington Beach, Calif. Space Systems Center

HUMAN ENGINEERING DESIGN CRITERIA STUDY Quarterly Progress Report No. 2, 1 Oct.-31 Dec. 1964

W. R. Harmer 7 Jan. 1965 57 p refs

(Contract NAS8-11256)

(NASA-CR-60855; A3-860-K447-M-2) OTS: HC $3.00/MF $0.50

Interim results are reported of literature searches in the areas of operational environment, safety, man's capability for weight lifting, control and display, decision making, anthropometry, clothing, and maintainability. Working bibliographies, lists of materials on order, and draft introductions to various chapters of the design criteria study are included. R.L.K.

N65-18365# Joint Publications Research Service, Washington, D. C.

PHILOSOPHICAL QUESTIONS OF CYBERNETIC MODELING

I. B. Novik 10 Mar. 1965 47 p refs Transl. into ENGLISH of the booklet "O Filosofskikh Voprosakh Kibernetícheskogo Modelirovaniya" Moscow, Znaniye Publishing House, 1964 p 1-40

(JPRS-29053; TT-65-30471) OTS: $2.00

CONTENTS:

1. ABOUT THE ESSENCE OF THE METHOD OF MODELING p 3-7 refs

2. THE FUNCTIONAL NATURE OF CYBERNETIC MODELING p 8-23 refs

3. THE DIALECTICS OF FUNCTION AND STRUCTURE IN CYBERNETIC MODELING p 24-29 refs

4. A MODEL-CYBERNETIC EXPERIMENT p 30-36 refs

5. CYBERNETIC MODELING AND STRENGTHENING THE INTERCONNECTION OF THE SCIENCES p 37-44

N65-18486*# National Aeronautics and Space Administration, Washington, D. C.

NASA QUALITY REQUIREMENTS AND COST CONTROL

Howard M. Weiss [1964] 12 p refs

(NASA-TM-X-56107) OTS: HC $1.00/MF $0.50

Some means are discussed whereby proper direction and implementation of quality system procedures can provide the necessary flightworthiness for launch vehicles and spacecraft while effectively managing quality costs. Unreasonable quality costs on NASA contracts appear to arise from a lack of understanding of the requirements, and a lack of selectivity in their application. Improved planning of quality programs and more face-to-face communication between official and contractor personnel are stressed for eliminating these gaps. More trained personnel and more training in the field of source inspections are also required. Improved planning of test programs and intelligent application and dissemination of their results are emphasized. E.P.V.

N65-18957*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

IBM 1401 SELECTIVE TAPE TO CARD. AOPB SYSTEMS MANUAL, PROGRAM DESCRIPTION

Patricia Ann Savage Aug. 1964 11 p

(NASA-TM-X-55169; X-542-64-261) CFSTI: HC $1.00/MF $0.50

The object is to punch one 80-character card image per record of those records of any Binary Coded Decimal (BCD) tape specified by the user. This program is written in Symbolic Programing System (SPS) for the IBM 1401. Input cards are punched in the described format to select those records of the BCD tape to be punched on card. The BCD tape remains unaltered. The output is punched cards. The records of the tape are taken to be consecutively numbered starting with the number 1 and going up to (potentially) 99999. Author

N65-19831# Lockheed Missiles and Space Co., Sunnyvale, Calif.

LONG-RANGE PLANNING AND TECHNOLOGICAL FORECASTING: AN ANNOTATED BIBLIOGRAPHY, SUPPLEMENT I

Peter R. Stromer, comp. Feb. 1965 40 p refs

(LMSC-5-10-65-3; SRB-65-1)

Emphasis is on planning within the aerospace and defense industry. During the past year both industry and government conducted introspective studies on such topics as potential convertibility of admitted industry overcapacity to peaceful pursuits and the economic impact of reductions in defense spending. Desirable diversification strategies and goals were rigorously assessed. While general conclusions may be lacking, sufficient data are available to aid in the decision-making process.

N65-19928*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

ADVANCED RESEARCH AND TECHNOLOGY IN THE AEROSPACE PROGRAM

Floyd L. Thompson 16 Mar. 1965 13 p Talk Presented to the AIAA Hampton Roads Section, Hampton, Va.

(NASA-TM-X-56202) CFSTI: HC $1.00/MF $0.50

Dr. Floyd L. Thompson, National Aeronautics and Space Administration, discussed the importance of advanced research and technology activities for the success of the nation's aerospace efforts, with emphasis on the Langley Research Center. A history of this research center as a national laboratory to study the various problems of flight, and its collaboration with other aeronautical research laboratories, is given. The responsibility of engineers and engineering to exploit natural resources and natural laws for the benefit of mankind should be reaffirmed, and a decision made as to what should be done, rather than merely how it should be done. G.G.

N65-20260 Joint Publications Research Service, Washington, D. C.

A METHOD OF SYNTHESIZING SEQUENTIAL NETWORKS

O. B. Babeyev *In its* Izv. VUZov: Instr. Bldg., Vol. VII, No. 6, 1964 24 Mar. 1965 p 57-63 refs (See N65-20252 10-09) CFSTI: $5.00

A method is presented for synthesizing sequential networks, suitable for application in engineering practice in planning and designing automated industrial systems with asynchronic logical elements. Examples of synthesizing relay networks are given. Author

N65-20411# Sylvania Electric Products, Inc., Waltham, Mass. Applied Research Lab.

DOCUMENT FORMAT RECOGNITION Final Report

Steven B. Gray Griffiss AFB, N.Y. RADC, Jan. 1965 465 p refs

(Contract AF 30(602)-3273)

(F-3060-1; RADC-TDR-64-463, AD-611632)

This study is primarily concerned with methods for analyzing the format of pages from technical journals, and means for automatically processing the textual and graphic material on these pages for input to a computer which is to perform textual data processing functions. The overall process is considered to be a format recognition and analysis program operating on a computer-controlled character recognition device. This study resulted in general design techniques for format recognition and analysis programs applicable to any document which occurs with text and graphics intermixed. Also considered in detail is a design for the universal print reader, which involves techniques tried and proven in present print reader devices. An augmented version of the universal print reader, which enables fully automatic page composition of translated versions of journal pages, is briefly described. Author

N65-20464# Joint Publications Research Service, Washington, D. C.

CYBERNETICS AND SOCIALIST MANAGEMENT

Georg Klaus and Gerda Schnauss 2 Apr. 1965 20 p refs Transl. into ENGLISH from Einheit (East Berlin), no. 2, Feb 1965 p 93-104

(JPRS-29409; TT-65-30640) CFSTI: $1.00

The functional behavior of the components of an economic system in the planning and management of a people's economy by cybernetics is discussed. Work with block diagrams permits the combination of more or less complex elements in a cybernetic overall system and simplifies the analyzing conditions. Abstraction by cybernetic methods consists of the following aspects: definition by abstraction as a specific form, discovery of invariants, discovery of transformations, and the black-box suitable for construction. The individual enterprises or economic sectors may be compared to partial systems connected to each other to form a total system with all the characteristics of a multistable cybernetic system. G.G

N65-20869# System Development Corp., Santa Monica, Calif.
STUDIES IN PROBABILISTIC INFORMATION PROCESSING
Richard J. Kaplan and J. Robert Newman 2 Oct. 1964 44 p refs
(SP-1743/000/00; AD-455028)

A theory of probabilistic information processing is outlined, and three experimental studies testing that theory are described. The theory is based on certain principles of the Bayesian statistical decision theory, and it is designed as an aid to human diagnostic decision making. The experiments were concerned with certain types of military diagnostic decisions. In general, the experimental results support the theory. The implications of the theory for practical applications are discussed, and suggestions are made for future research. Author

N65-21145# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).
A REVIEW OF LITERATURE ON OPERATIONS RESEARCH
24 Dec. 1964 32 p refs In DUTCH *Its* 8th Yearly Issue, No. OR-65

This review contains several abstracted summaries of research papers pertaining to complex problems in management science and operations research. Mathematical programing techniques are proposed for control system design and optimization, with the application of linear, nonlinear, stochastic, integer, and dynamic programing to various types of control problems. The principal subject areas covered are: (1) mathematical programing techniques for solution of control problems; (2) advances in control theory for mathematical programing in optimal control and related areas; (3) advances in mathematical programing techniques relevant to control applications, and (4) computers and computer programing in control systems. Trans. by G.G.

N65-22034# Northwestern Univ., Evanston, Ill.
WHIRLPOOL, A COMPUTER PROGRAM FOR "SORTING OUT" INDEPENDENT VARIABLES BY SEQUENTIAL MULTIPLE LINEAR REGRESSION
W. C. Krumbein, Betty T. Benson, and W. B. Hempkins 1964 53 p refs
(Contract Nonr-1228(26))
(TR-14; AD-611142)

The problem of identifying those variables in some larger set that exert most control on a given dependent variable is encountered in many earth-science problems. A variety of methods is available for ranking independent variables in the order of their importance, and the procedure described here is based on a straightforward least-squares use of the general linear model. The method consists in taking the independent variables one at a time, two at a time, and so on, until all possible combinations are included. Thus, no assumptions are made about the significance of any variable or combination of variables: the full output is presented to facilitate substantive evaluation. The program is designed as a data-search procedure, although it can be modified to include F tests and similar aspects of more formal statistical analysis if desired. This report describes the mathematical procedures involved, it illustrates the method with a geological example, and it includes instructions for program operation. A Fortran II listing of the program is given. Author

N65-22475# Air Force Systems Command, Wright-Patterson AFB, Ohio. Behavioral Sciences Lab.
PREDECISIONAL PROCESSES IN DECISION MAKING: PROCEEDINGS OF A SYMPOSIUM
Darwin P. Hunt, ed. et al Dec. 1964 207 p refs Symp. held at Wright-Patterson AFB, Ohio, Apr. 1962
(AMRL-TDR-64-77; AD-613180)

Predecisional processes may be characterized as the search for, the acquisition of, and the evaluation of information prior to the choice of a course of action. The objectives were an assessment of the adequacy of present decision theories in dealing with human decision making behavior; an assessment of other approaches to decision making situations; and an analysis of predecisional processes. Seven papers are presented that analyze this area from several different theoretical viewpoints. Transcripts of the discussions are also included. Author

N65-23231# United Kingdom Atomic Energy Authority, Harwell (England). Engineering Div.
INTRODUCTION TO CRITICAL PATH PLANNING
G. T. Sneddon Sep. 1963 34 p
(AERE-M-1280)

This paper describes techniques to produce a network showing the activities relating to any particular project, the emphasis being upon the practical problems encountered in preparing the network to suit the facts of the case. A simplified example is used to demonstrate the pitfalls and the method of analysis. Author

N65-23960# Martin Co., Baltimore, Md.
PERSONNEL SUB SYSTEMS
D. G. Thomas [1964] 23 p refs Presented at Eurospace Conf., Brussels, 23-24 Jan. 1964

The use of this analytical basis for the determination of the allocation of functions to man and machine forms the cornerstone of the concept referred to as Systems Functional Analysis. This analysis begins with a definition of the proposed mission and describes in detail the functions essential to the fulfillment of the mission requirements. The initial step is the description in general of the gross functions of the system. Progressively, these gross functions are further defined into subfunctions, and sub-subfunctions. Allocation of these functions, severally, to man or machine, respectively to their relative capability, reliability, economy, etc., can then be performed. The techniques for accomplishing this objective, which constitute a methodology for human engineering support of system design, can be approached by generating an appropriate checklist and precisely articulating a task sequence analysis, in terms of logic symbols. Author

N65-23967# Martin Co., Baltimore, Md.
PRINCIPLES OF INTERFACE MANAGEMENT IN ADVANCED PROJECTS
Carl Kober Paris, Eurospace, [1964] 29 p Presented at the U.S.-European Conf., Rome, 22-24 Jun 1964

The evolution of systems procurement management from the early laboratory system to the current interface management concept is discussed, with emphasis on the control of interfaces between the associate and the participating government agencies in a given system development program. This interface management concept uses the building block idea to replace the concurrency concept. Complete program definitions include standardized specifications, time/cost information, and the schedules interface logistics which ensures complete interface control and excellent configuration control. G.G.

N65-23968# Eurospace, Paris (France).
PROCEEDINGS OF THE U. S.-EUROPEAN CONFERENCE HELD IN ROME ON THE 22-24 JUNE 1964
[1964] 47 p

Six papers on management which were presented by U.S. speakers are reported. Topics included *The Integration Tools of System Management*, focusing on the Minuteman system; *Cost Effectiveness in a Development Programme*, focusing on cost effectiveness as used to compare the performance of one program to another and as a decision making aid within existing programs, and the use of this concept in the Saturn program; *Testing of Booster Upper Stages*, focusing on the Agena vehicle; *Reliability and Environmental Testing of Spacecraft*, focusing on the selection of the correct level of reliability and the amount of testing required to attain this level; *Principles of Interface Management in Advanced Projects*, focusing on Syncom, Advanced Syncom, and Early Bird. Each paper contains a discussion in which comments of European speakers are included. Also included in the report is a list of papers available at EUROSPACE. S.C.W.

N65-23971# Boeing Co., Seattle, Wash.
THE INTEGRATION TOOLS OF SYSTEM MANAGEMENT
H. K Hebeler Paris, Eurospace, [1964] 46 p Presented at the U. S -European Conf., Rome, 22-24 Jun. 1964

Discussed are the major tools of system management which relate to the integration of the work of one contractor with the work of another, with emphasis in the areas of work and time management. These tools are initiated and reviewed by pure management organizations; and actually detailed and completed by the functional organizations. Integration tools of work management consist of event logic networks for work definition; program plans for agreement on how work will be done; systems requirements analysis for identifying and quantifying equipment, manning, and procedures, and interface control for responsibility assignment to insure compatible mating hardware. Integration tools of system schedule management consist of establishing schedules; keeping track of progress; and taking corrective action in system management. G.G.

N65-24019*# National Aeronautics and Space Administration, Washington, D. C.
APOLLO PROGRAM: MASS PROPERTIES STANDARD
M. L. Seccomb 1 Jun. 1965 92 p Updates M-DE-8000.006
(SP-6004; CMO-18-001-1) CFSTI: HC $3.00/MF $0.75

This document establishes a system for the management of mass properties during procurement and use of space vehicles. It is designed to permit acquisition of systematized, verifiable and controllable mass properties of vehicle systems, to facilitate rapid establishment and reporting of inputs for the weight-performance relationship, and to enable parametric extrapolation from the reported systems to newly evolving systems. Author

N65-24203# California Univ., Berkeley. Operations Research Center
OPERATIONS RESEARCH IN THE WORLD OF TODAY AND TOMORROW
George B. Dantzig Jan. 1965 12 p
(Contracts Nonr-222(83); Nonr-3656(02); Grant NSF GP-2633)
(ORC-65-7; AD-614579)

The developments in recent years of the electronic computer and mathematics, and their penetration into almost every phase of human activity is discussed. Also, operations research and cybernetics, the science of control, are reviewed. It is observed that cybernetics, in a broad sense, is operations research. Further, the sense of urgency and the priority given to the subject of cybernetics by the Soviet Union is considered. E.E.B.

N65-24211# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences
THEORY OF GROWTH: REMODELLING AND REFINEMENTS
Michio Morishima 12 Apr. 1965 60 p refs
(Contract Nonr-225(50))
(TR-132; AD-614252)

When all the factors of production are produced in the system and capitalists' consumption is allowed, the existence of the Golden Equilibrium (or the von Neumann equilibrium) can be proved even with a weak Malthusian assumption. The equilibrium turns out to be a state of instantaneous efficiency as well as a temporary Pareto optimum. However, its intertemporal efficiency and optimality do not necessarily follow. If all goods and labor are provided at the beginning in positive amounts without the limitational factor being specified, then all efficient paths defined in terms of the final stages converge on the turnpike in the broad sense that the average output per man over T periods of each goods approximates the turnpike output per man when T tends to infinity. The consumption turnpike theorem is discussed on the assumption that society maximizes the utility that depends on the discounted average of consumption streams and the population stream. Author

N65-24408# Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering
EVALUATION OF TECHNIQUES AND DEVICES AS APPLIED TO PROBLEM SOLVING Final Report
Morris Rubinoff, J. F. White, Jr., David Loev, and Donald F. Blumberg Griffiss AFB, N.Y., RADC, Feb. 1965 110 p refs
(Contract AF 30(602)-3065)
(RADC-TDR-64-402; AD-614228)

The problem of forecasting technological change is investigated. Machines and computer programs having "problem solving" capabilities are examined to determine their usefulness in aiding or replacing the human forecaster. The literature on human problem solving was also reviewed. The following conclusions were reached: (1) The nature of the forecasting problem precludes the use of computer-type problem solvers developed to date. (2) The application of information science techniques—descriptors representing technological concepts, the forces acting to change the technology and the laws governing the change—appear to offer the most promise in assisting the human forecaster. Accordingly, a quasi-mathematical model was developed using matrix notation to describe a technology. An example of a forecast of computer technology made several years ago is included. Author

N65-25598*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.
NASA PERT TIME II
Ross C. Bainbridge and Elizabeth Ryan Washington, NASA, Jun. 1965 21 p ref
(NASA-TN-D-2863) CFSTI: HC $1.00/MF $0.50 CSCL 09B

Flexibility, adaptability, and efficiency are the prime considerations of the NASA PERT Time II program, which is designed to be compatible with current and future data processing equipment configurations in use throughout both government and industry. It is also compatible with standards of input/output and is designed to cross computer manufacturing lines. The program can easily be modified to change the approach of analyzing methods of reporting PERT time networks. The capacity of the program exceeds 30,000 activities when utilizing a modular technique. Author

N65-25789# North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.
DEVELOPMENT OF AN ABSTRACT MODEL FOR AEROSPACE MAINTENANCE SYSTEMS Final Report
Charles M. Riehl, John P. Van Blarcom, Claire B. Schneider, and Ralph J. Ceci, Jr. Wright-Patterson AFB, Ohio, AF Aero Propulsion Lab., 9 Mar. 1965 347 p
(Contract AF 33(615)-1330)
(SID-64-2172; AFAPL-TR-64-150; AD-612905)

Development and operation of a digital computer model capable of simulating aerospace maintenance systems is described. Model scope is concerned with both prelaunch maintenance activity, performed to prepare an aerospace system for launch, and postlaunch maintenance activity performed during the mission. Distinct submodels were developed for each phase. The model routines are written in SIMSCRIPT program language to enable model application to a variety of aerospace programs. Model flow patterns are generally deterministic, with allowances for disruptive events caused at random times [illegible] hardware malfunctions. The model is assigned to produce [illegible]jctive output information regarding the operation and [illegible]ency of the maintenance system during the time period [illegible]erest and for its contribution to the aerospace program [illegible]ms of schedule fulfillment. Author

N65-25937# North Carolina Univ., Chapel Hill. Psychometric Lab.

BAYESIAN DECISION THEORY, GAME THEORY AND GROUP PROBLEM SOLVING

David M. Messick Bedford, Mass., AFSC, Electron. Systems Div., Oct. 1964 17 p refs

(Contract AF 19(628)-1610)

(ESD-TDR-64-603; AD-614683)

Concepts of the ideal information-processor and rational decision-maker to a group problem solving are presented. The structure of the selected task is seen as a nonzero sum game. A strategy is derived which is the equivalent of the Nash solution to the game. The notion of level of aspiration is discussed and defined within the analysis, and two theorems are proved relating level of aspiration to type of group decision strategy employed. Author

N65-26415*# Massachusetts Inst. of Tech., Cambridge. Alfred P Sloan School of Management

THE ULTILIZATION OF INFORMATION SOURCES DURING R&D PROPOSAL PREPARATION

Thomas J. Allen Oct. 1964 34 p refs Sponsored by NASA

(Grant NSF GN-233)

(NASA-CR-63407) CFSTI: HC $2.00/MF $0.50 CSCL 05B

Twenty-two proposal competitions for government R&D contract, involving 156 proposal teams, are examined to determine the relative use of three sources of technical information. The extent to which each proposal team relied upon literature search, the use of staff specialists within the lab and the use of outside sources of information is related to the rated technical quality of its proposal, and to other variables characterizing the proposal team and its parent laboratory. Twenty-two percent of the total time expended by 156 proposal teams was devoted to the seeking and gathering of technical information. Of the three information sources used, only one, laboratory specialists, appears to be at all directly related to the technical quality of the product and this relation is weak and unreliable. Technical quality is inversely related to the extent to which the proposal team relies upon individuals outside of the laboratory as sources of information. Author

N65-26424*# Massachusetts Inst. of Tech., Cambridge. School of Industrial Management

THE DESIGN OF RESEARCH AND DEVELOPMENT POLICY

Edward B. Roberts 16 Jan. 1963 42 p refs

(Grant NsG-235-62)

(NASA-CR-63406) CFSTI: HC $2.00/MF $0.50 CSCL 05A

Problems of research and development managers demand a management laboratory for the design and testing of new policies. This laboratory approach is now possible based on the concepts and methodology of Industrial Dynamics and on a new systems framework for representing project life cycles. The bases for a behavioral model of R and D projects are presented, as are some results of the computer simulation studies of the model. Conclusions drawn from these investigations suggest the important of risk-taking and integrity of R and D organizations, and also indicate several areas in which government procurement policies seem self-defeating. Author

N65-27316# Electronic Systems Div., Bedford, Mass. Directorate of Computers

ADVANCED PROGRAMMING DEVELOPMENTS: A SURVEY

Feb. 1965 108 p refs Prepared jointly with Computer Associates, Inc.

(ESD-TDR-65-171; AD-614704)

This document constitutes a representative survey of twenty computer software systems which have been developed within the last decade. The surveyed systems have been grouped into six major categories (1) general purpose programming and executive systems; (2) functional systems; (3) man-machine interface systems; (4) special purpose programming systems; (5) time-sharing systems; (6) generalized data management systems. Each system discussed within these categories exhibits a particular feature or set of features which constitutes a distinct contribution to the effort to produce more general, more flexible and less job dependent systems which can be conveniently operated by a user. The survey notes that to date efforts to develop these features into integrated computer systems and sub-systems exist only on a small scale and in only a small number of laboratories scattered across the country. In view of the many potential applications of such integrated, generalized computer systems, especially in military environments, the survey concludes that the time is ripe for a technical program designed to demonstrate the feasibility of generalized computer systems and sub-systems in the solving of traditional data processing problems. Author

N65-28148# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

THE APPLICATIONS OF COMPUTERS TO THE APL STORAGE AND RETRIEVAL SYSTEM

F. L. Kennedy and M. E. Brown Mar. 1965 25 p refs

(Contract NOw-62-0604-c)

(APL-TG-669; AD-467339)

An information retrieval system has been developed that can be used either with an IBM 1401 or a 7090 computer. Details are given on the cataloging procedures, methods of selecting descriptors, and search techniques. Features of the system as applicable to the two computers are compared. Author

N65-28853*# Kansas State Univ., Manhattan.

ANALYTIC STUDIES IN THE LEARNING AND MEMORY OF SKILLED PERFORMANCE Second Semi-Annual Report, Oct. 1, 1964–Mar. 30, 1965

Merrill E. Noble and Don A. Trumbo 20 Apr. 1965 22 p

(Grant NsG-606)

(NASA-CR-63837) CFSTI: HC $1.00/MF $0.50 CSCL 05J

A study was performed to evaluate the role of sequential length on the acquisition and retention of skill when the task involves coherent and partially coherent sequences. Methods and procedures used in the study are presented. Results are given for the first analyses for error scores on the training since the retention phase of the study is not completed. It is suggested that the information provided from this study will aid in the description of the information processing capacities and limitations of the human operator, and his ability to retrieve and use such information after extended periods of disuse. N.E.A.

N65-29233# United Kingdom Atomic Energy Authority, Harwell (England). Theoretical Physics Div.

A WORKSHOP SCHEDULING PROCEDURE

T. A. J. Nicholson Mar. 1965 30 p refs

(AERE-M-1568) HMSO: 4s

A procedure is described to schedule jobs through a workshop. Each of the jobs consists of a specified sequence of operations, and the procedure is designed to order these operations through the machines efficiently in terms of a management objective. The usual objective is to complete the work in the minimum time, but in this paper three objectives are distinguished. The procedure does not necessarily provide an optimal scheduling, but it should be near optimal. It is essentially simple and easy to implement. Author

N65-30243# Mitre Corp., Bedford, Mass.
PAT, A LANGUAGE FOR PROGRAMMING AND MAN-COMPUTER COMMUNICATION
R. Silver and C. Wells. Bedford, Mass., AFSC, Electron. Systems Div., Jun. 1965. 35 p. refs
(Contract AF 19(628)-2390)
(W-07191; ESD-TDR-64-636, AD-617344)

PAT is a computer language of the macro-assembly type. The program, which translates PAT into computer code, is designed to be used not only as a compiler of programs, but as a symbolic interface between a user and a computer. In this latter capacity, it can serve to interpret commands and accept command definitions for such programs as a text editor, on-line debugger, or simulated desk calculator. The language and the translator have been designed to allow the structure of the translator itself to be modified by certain definitions encountered during the translation process. The rules for defining symbols and referring to them have been organized to facilitate combining independently written programs into a single unit. Author

N65-30279 Joint Publications Research Service, Washington, D. C.
PROBLEMS OF THE MECHANIZATION OF MANAGEMENT WORK
L. G. Petrova. *In its* Cybernetic Principles Appl. in Educ. and Econ. 26 Jul. 1965. p. 10-15. (See N65-30278 19-05) CFSTI: $1.00

A textbook on the mechanization problems of management in industry is reviewed. The book was written especially for students specializing in the mechanization of accounting and planning enterprises of modern industry. The first part of the book relates to the mechanization and automation of management. It examines the process of algorithmic description and measuring of information. The second section of the book treats the problems of organization, technological normalization, and wages at computer establishments. It is observed that the introduction of modern computing techniques together with modern mathematical methods in the field of managerial work in industry cuts down the cost of manufactured products, increases labor productivity, and the more efficient use of productive capacity. It is noted that the book is written on a high scientific, theoretical and methodical level. Tables are well prepared, showing data obtained from the practice of existing industrial enterprises. E.E.B.

N65-30316 Autometics, Anaheim, Calif.
MANAGEMENT OF THE HUMAN ELEMENT IN THE PHYSICS OF FAILURE
John F. Beau. *In* RADC Phys. of Failure in Electron., Vol. 3. Apr. 1965. p. 264-279. (See N65-30300 19-09)

A system for better management of the human element in the physics of failure is described. The system provides for the realization by management, quality control, manufacturing, and engineering that failure causing workmanship defect escapes can be controlled in a routine manner and that such a system is independent of time and personnel changes; allocation of a portion of the reliability budget to escaped workmanship defects and relating it to a quality budget; apportionment of the quality budget to the working level so that workers know what they have to achieve; establishment of a standard for classifying defects in relation to reliability requirements, use of human factors experts to provide assistance; use of an audit system to measure the performance of inspection personnel thereby providing them with knowledge of their performance; and establishment of a practical standard of effectivity for inspection personnel. R.N.A.

N65-30583# Atomic Energy Commission, Oak Ridge, Tenn. Div. of Technical Information Extension.
NUCLEAR MATERIALS MANAGEMENT: AN ANNOTATED BIBLIOGRAPHY OF SELECTED LITERATURE
Theodore F. Davis and James E. Lovett. Aug. 1965. 157 p. (TID-3315) CFSTI: $5.00

A total of 845 selected references to unclassified reports and published literature is presented covering all phases of activity in the field of nuclear materials management. An appendix detailing the scope of the field and Personal Author, Report Number and Availability, and Subject Indexes are included. The references given were selected from Nuclear Science Abstracts and cover the period from 1951 to 1964. The references are arranged by reports, journal articles, engineering drawings, patents, translations, and miscellaneous. N.E.A.

N65-31427 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIENCE OF DESIGNING OF GROUP TREATMENT OF PARTS IN MECHANICAL WORKSHOPS OF AIRCRAFT BUILDING FACTORIES
F. I. Bogomolova. *In its* Ways of Further Improvement of Organ. and Planning of Aviation Production. 9 Feb. 1965. p. 28-49. refs. (See N65-31425 20-34)

Group treatment of parts in small-lot production yields economic benefits and increased production. The technique is especially applicable to machine workshops. Classification of parts for group treatment, improvement of technological processes during group treatment of parts, industrial organization, and methods for calculating economic advantages of group processing are considered. E.W.

N65-31428 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHODS OF DISTRIBUTION OF OUTPUT OF FINISHED PRODUCTS BY TEN-DAY PERIODS AND MONTHS OF PLAN PERIOD
V. I. Tikhomirov. *In its* Ways of Further Improvement of Organ. and Planning of Aviation Production, 9 Feb. 1965. p. 50-56. (See N65-31425 20-34)

Methods are outlined for regulating production processes so that the quantity of finished products meets the scheduled requirements and so that the factory operation is reasonably uniform. Plans are given for increasing output and for diminishing output, as for a discontinued item. It is concluded that output must be planned in ten day or monthly periods in order to fulfill quantity commitments and to preserve the rhythm of the production process. E.W.

N65-31432 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHODS OF CALCULATION OF ECONOMIC EFFECTIVENESS OF SPECIALIZATION OF AIRCRAFT BUILDING PRODUCTION
V. I. Tikhomirov. *In its* Ways of Further Improvement of Organ. and planning of Aviation Production. 9 Feb. 1965. p. 169-179. refs. (See N65-31425 20-34)

Formulas are derived for calculating the economic advantages of specialization in aircraft production. Each method is analyzed, and it is shown that none of the techniques are acceptable for calculating the economic effectiveness of one or another form of specialization in industry. E.W.

N65-31434 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF ENLARGED CALCULATION OF TECHNICO-ECONOMIC EFFECTIVENESS OF EQUIPMENT OF TECHNOLOGICAL PROCESSES
M. P. Veselov. *In its* Ways of Further Improvement of Organ. and Planning of Aviation Production. 9 Feb. 1965. p. 209-216. refs. (See N65-31425 20-34)

One method for calculating the technico-economic effectiveness of industrial processes is analyzed. Model nomographs and examples of their use are presented. It is concluded, however, that this technique cannot be used to calculate the prime cost of any given production procedure. E.W.

N65-31750# Joint Publications Research Service, Washington, D. C.

STOCHASTIC LINEAR PROGRAMMING AND OPTIMUM METABOLISM IN CYBERNETICS

16 Aug. 1965 14 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Kibernetika i Teor. Regulir. (Moscow), v. 162, no. 1, 1965 p 33-35, 201-204

(JPRS-31561; TT-65-32057) CFSTI: $1.00

Two theoretical topics in systems optimization are reported: a stochastic linear programming problem is solved which can be used in determining optimal production volumes where there are initial statistical or probabilistic estimates of ultimate volume requirements; and a metabolism model is formulated which is used to investigate the mechanism of self-adjustment after disturbance of the stationary state in a network of metabolism processes in a mature organism. J.M.D.

N65-31768# Rocky Flats Div., Dow Chemical Co., Golden, Colo.

INTRODUCTION TO TOLERANCE CHARTS: AN ELEMENTARY TREATMENT OF THEIR FORMATION AND USE

Frank Van Dok Nov. 1964 34 p refs

(Contract AT(29-1)-1106)

(RFP-432)

A general introduction to tolerance charts is presented. A tolerance chart is defined, and its purpose and need in industry, and its place in a sequence of events for a manufacturing process are discussed. A format for preparing a tolerance chart is outlined and a test problem is provided. R.N.A.

N65-31930# General Electric Co., Bethesda, Md. Information Systems Operation.

AIR FORCE PERSONNEL SYSTEM AND DISPLAY CONSOLE STUDY Final Report

D. V. Torr, M. V. Russell, H. G. McGuire, and E. E. Howard 28 Jul. 1965 220 p

(Contract AF 41(609)-2628)

(FR1-168-10)

The personnel system of the Air Force was analyzed to identify variables necessary for the effective management of personnel. Information flow within the personnel system was identified. A set of cathode ray tube display formats were developed for use in a personnel forecasting model. Functional equipment specifications for a display console compatible with the IBM 7040 computer are presented. R.N.A.

N65-32076*# Missouri Univ., Columbia.

[A STUDY OF THE LOCATION OF SCIENTIFIC RESEARCH AS AN ECONOMIC PHENOMENON] First Semiannual Progress Report, Feb. 1-Jul. 31, 1965

[1965] 21 p refs

(Grant NGR-26-004-012)

(NASA-CR-64446) CFSTI: HC $1.00/MF $0.50 CSCL 05C

Progress is reported on the investigation of cost structures in research facilities. The studies in this program are directed toward analyzing the effects of clustering or agglomeration on the cost of performing certain kinds of research activities

This involves an improvement in the theory of agglomeration, extending the theory to include research, and the empirical documentation of variations produced in costs (if any) by the presence of other economic or research activity in the same local area. The sequence for the overall project is outlined. Bibliographic and source material have been prepared and a compendium of the listings of all types of research laboratories has been developed. Also, a self-cumulating file has been established and interviews with scientists and engineers in various fields have been conducted. The first-generation and second-generation studies are outlined. The population to be sampled for the first-generation study consists of industrial research laboratories in the United States. The sample design utilizes proportionate stratified, cluster, and simple random sampling principles. E.E.B.

N65-32234# Stanford Univ., Calif Inst. for Mathematical Studies in the Social Sciences

AN INPUT-OUTPUT SYSTEM INVOLVING NON-TRANSFERABLE GOODS

Michio Morishima and Yasuo Murata 30 Jun. 1965 21 p refs

(Contract Nonr-225(50))

(TR-134; AD-618404)

The most important characteristics of capital goods are durability and nontransferability. When time goes on, the number of periods during which a capital good can survive decreases, and it becomes less productive. The other problem relates to the fact that no capital good can be transferred to another industry once it has been installed in some industry. This paper re-examines the dynamic input-output model of Leontief's type from this point of view, and shows how it has to be altered, on the assumptions that there is no technical change and that prices are so flexible as to establish the long-run equilibrium price conditions instantaneously. We begin by proving the dynamic substitution theorem, assuming the existence of differentrable general neo-classical production functions, taking vintages of capital goods into explicit account. Then the existence of the golden equilibrium of the model is discussed. Author

N65-32694# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STANDARD OF PROGRESS

V. Kalmykov 25 Jun. 1965 8 p Transl. into ENGLISH from Izvestiya (Moscow), 22 May 1965 p 5

(FTD-TT-65-705/1+4; AD-617669)

Technical progress in radio electronics and its impact on the general economy and military endeavors are discussed in narrative form. Because radio electronics has penetrated many areas in culture, science, and technology, it is considered a powerful means of increasing labor output. M.W.R.

N65-32713# Massachusetts Inst. of Tech., Cambridge.

A NEW METHODOLOGY FOR COMPUTER SIMULATION

Martin Greenberger [1964] 30 p refs Presented at the Conf. on Computer Methods in the Analysis of Large-Scale Social Systems, Cambridge, Mass., 19-21 Oct. 1964

(Contract Nonr-4102(01); Proj. Mac.)

(MAC-TR-13; AD-609288)

Computer simulation is a cooperative venture between researcher and information processor, but the processor's role customarily begins too late. The researcher can benefit substantially by bringing the computer up into the earlier, creative phases of the simulation process. An on-line computer system that makes this possible is described. Author

N65-33524# RAND Corp., Santa Monica, Calif.

PROGRAMMING BY QUESTIONNAIRE

Allen S. Ginsberg, Harry M. Markowitz, and Paula M. Oldfather Apr. 1965 47 p

(Contract AF 49(638)-700; Proj. RAND)

(RM-4460-PR; AD-613976)

A questionnaire technique for reducing the cost and time required to produce computer programs within specified areas of application is described. The approach is to present the user with a set of possible options, expressed in an English launguage questionnaire. By choosing from these options, the user specifies all the information necessary to construct his desired computer program. A "Generator" program, informed of the selected options, then constructs the desired program and specifies the data that the user must supply in order to execute the generated program. Included are data on the components of the Generator program and primary advantages of this method. The mechanics of the program generation process are discussed in terms of an illustrative Job Shop Simulator Program Generator (JSSPG). S.C.W.

N65-34332# Auerbach Corp., Philadelphia, Pa.
DESIGN OF RELIABILITY CENTRAL DATA MANAGEMENT SUBSYSTEM Final Report
J. Sable et al Griffiss AFB, N. Y., RADC, Jul. 1965 160 p refs
(Contract AF 30(602)-3433)
(RADC-TR-65-189, Vol. II; AD-469269)

Volume II on the design of the reliability central data management subsystem is presented. Section I contains general information and background on the development of data management systems, and summary of report conclusions. Section II provides a consolidated chart summarizing the system comparisons from which the conclusions are drawn. Section III contains a description of the objectives and design of the reliability central data management subsystem. Detailed comparisons between the reliability central data management subsystem and each of the other systems are given in Section IV. A comprehensive discussion of all comparisons and conclusions is presented in Section V. R.N.A.

N65-34549# Auerbach Corp., Philadelphia, Pa.
DESIGN OF RELIABILITY CENTRAL DATA MANAGEMENT SUBSYSTEM Final Report, 5 May 1964–26 Apr. 1965
J. Sable, M. Dodge, P. J. Dixon, and T. Raday Griffiss AFB, N. Y., RADC, Jul. 1965 388 p refs *Its* Rept-1193-TR-3
(Contract AF 30(602)-3433)
(RADC-TR-65-189, Vol. I; AD-620025)

This report describes the initial design of an automatic data processing system for Reliability Central referred to as the Reliability Central Data Management System (RCDMS). The design was accomplished as a 12 month effort ending May 1965. Volume I contains a description of RCDMS including all major operational requirements, operational functions, and design aspects, although some are only initial descriptions. The detailing of the design elements are scheduled to be carried out in a subsequent effort. In Volume II, RCDMS is compared with other major data management systems which represent current state of data processing and information storage and retrieval systems. Some of these examined are LUCID, COLINGO and ADAM. Author

N65-35594# Purdue Univ., Lafayette, Ind. Dept of Statistics
ON SOME MULTIPLE DECISION (SELECTION AND RANKING RULES
Shanti S. Gupta Aug 1964 37 p refs *Its* Mimeograph Ser. No. 21
(Contracts AF 33(657)-11737; Nonr-1100(26))
(AD-607097) CFSTI: $2.00

This paper deals with some multiple decision (ranking and selection) problems. Some relevant distribution theory is given and the associated confidence bounds are derived for the differences (ratios) between the parameters. The selection procedures select a non-empty, small, best subset such that the probability is at least equal to a specified value P that the best population is selected in the subset. General results are given both for the unknown location and scale parameters of the k populations. Some desirable properties of these procedures are studied and proved. Selection of a subset to contain all populations better than a standard is also discussed. Performance characteristics of some procedures for the normal means problem are studied and tables are given for the probabilities of selecting the i^{th} ranked population and for the expected proportion and the expected average rank in the selected subset. A brief review of work by other authors in the problems of selection and ranking and in other related problems is given. Author

N65-36014# Office of Naval Research, Washington, D. C.
AUTOMATION AND THE NAVY
[1964] 187 p refs Proc. of the 8th Navy Sci. Symp. held at the U.S. Naval Postgraduate School, Monterey, Calif., 13-15 May 1964
(ONR-21, Vol. 1; AD-608681) CFSTI: $3.00

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11. THE APPLICATION OF COMPUTERS TO SOME HYDRODYNAMIC PROBLEMS IN SHIP DESIGN F. H. Todd (David Taylor Model Basin) p 150-175 refs

N65-36204# System Development Corp., Santa Monica, Calif.
SEMIANNUAL TECHNICAL SUMMARY REPORT TO THE DIRECTOR, ADVANCED RESEARCH PROJECTS AGENCY FOR THE PERIOD 18 NOVEMBER 1964–17 MAY 1965
C. Baum, ed. [1965] 35 p refs
(Contract ARPA SD-97)
(TM-687/004/00)

Computer programing techniques are being developed to provide capabilities for time sharing, for the use of large computer systems by nonprogramers, and for handling natural language. A number of hardware and software changes were incorporated into the Q-32 computer resulting in a more reliable, responsive, and easier to use system. The LUCID and general purpose display system are operating well enough for demonstration purposes. The program was expanded to include work that exploits the potentials of on-line usage. This included modifications of the JOVIAL language to include useful features of TINT, an on-line interpretive JOVIAL system. Experimentation was conducted with interactive compilers enabling the on-line programer to communicate error messages and to ask for system responses. In the time sharing operations, the number of users exceeded the system capability, requiring priorities and scheduling. A program was developed enabling computer operators to monitor the system's use. Work was begun on the LISP II language and compiler system. Studies were initiated to determine if large data base handling systems can profit from being formulated in a list structure language. R.N.A.

N65-36350*# National Aeronautics and Space Administration, Washington, D. C.

NASA'S TECHNOLOGY UTILIZATION PROGRAM

[1965] 18 p

(NASA-TM-X-56872) CFSTI: HC $1.00/MF $0.50 CSCL 05B

Means of disseminating information about NASA's mission, research endeavors, and technological advances are considered in terms of utilization by technical personnel. Discussed are the three basic services of the regional dissemination centers: (1) monthly searches of tapes dealing with technical reports and journal articles for information of possible value to center clients; (2) complete searches of the entire collection of more than 200 000 documents; and (3) distribution of technical publications to member companies on a weekly basis. The areas in which NASA conducts research and collects reports, the kinds of reports that are available, some of the results of the technology utilization program, and patents and licenses are considered. Procedure for obtaining the benefits of the program is given. M.W.R.

A66-10050

PLANNING AND SYSTEM SELECTION UNDER RISK AND UNCERTAINTY.

Alan S. Goldman (General Electric Co., Santa Barbara, Calif.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]

Edited by John de S. Coutinho.

Washington, Spartan Books, Inc., 1965, p. 63-74. 23 refs.

Discussion of the real world of planning and selecting systems, and of the evaluation of alternatives which involves risk-taking decisions under numerous uncertainties. The distinction between the concepts of risk and uncertainty is considered, and a basic procedure for decision-making under risk and uncertainty is presented. A specific example is used to illustrate how the logic of system selection under risk and uncertainty can be employed in a step-by-step reasoning process through several time periods. M.M.

A66-10051

OPERATIONAL READINESS - A DECISION-MAKING TOOL FOR RELIABILITY-MAINTAINABILITY MANAGEMENT.

Elmer L. Peterson and Howard L. Steverson (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]

Edited by John de S. Coutinho.

Washington, Spartan Books, Inc., 1965, p. 75-86.

Description of the operational readiness (OR) concept which is the integration of the interfacing functions of reliability-maintainability-safety (RMS), human engineering, and operational planning to the attainment of the common objective. The OR program benefits to be derived include (1) base-line requirements (derived from estimation of capabilities during time critical periods); (2) preplanned support/reliability; (3) visibility and supportive data for tradeoffs in areas of support-design changes-reliability; (4) overall management control; and (5) continuity of effort from operational requirement to operational requirement. The OR concept involves (1) stressing of the management aspect; (2) use of computerized technique primarily as a management tool; (3) provision of closed loops for action items; (4) identification of responsibilities and interfaces within departmental functions; (5) documentation of action items, design changes, problem solutions, tradeoffs, and test results; and (6) provision of total systems integration of the outputs of otherwise physically (and frequently communicatively) separate departments. M.M.

A66-10052

COST-EFFECTIVENESS MANAGEMENT.

E. S. Winlund (Douglas Aircraft Co., Inc., Missile and Space Systems Div., Santa Monica, Calif.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]

Edited by John de S. Coutinho.

Washington, Spartan Books, Inc., 1965, p. 87-96. 20 refs.

Brief review of developments that may lead to efficient cost-effectiveness management in the year 1980. It is pointed out that, by the year 1980, many contractors will have developed continuous analysis and reporting systems that will satisfy management needs. M.M.

A66-10073

SAFETY EDUCATION AND THE MANAGEMENT PROCESS.

Carl Hancey (Southern California, University, University College and Aerospace Safety Div., Los Angeles, Calif.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]

Edited by John de S. Coutinho.

Washington, Spartan Books, Inc., 1965, p. 325-327.

Examination of the relations among safety, education, and management. The development of education for aerospace accident preventers is reviewed, and safety education is related to management education. The belief is expressed that safety education has been the key that has opened the door to new concepts of management education: it serves to reemphasize the role the safety practitioner can play in the total management process since much of his basic education and experience is, in concept, the same as that required for management. M.M.

A66-10075

SAFETY AND MANAGEMENT - A PANEL DISCUSSION.

Donald R. Theleman (Northrop Corp., Norair Div., Flight Safety Branch, Hawthorne, Calif.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]

Edited by John de S. Coutinho.

Washington, Spartan Books, Inc., 1965, p. 333-335.

Panel discussion of safety and management intended as a forum for some of the top safety personnel of aerospace industry systems to discuss the relationship of their organizations and activities with their higher managements. Observations are made relative to the evolution of the systems safety effort. The importance of military specifications which require contractors to establish systems safety engineering programs, is discussed. Recommendations are presented for the benefit of the managements of companies comprising the aerospace community to further the cause of accident prevention. M.M.

A66-10098

MANUFACTURING RELIABILITY CONTROL THROUGH PRACTICAL MANAGEMENT.

J. D. Eagen and V. M. Werbach (Martin Marietta Corp., Martin Co., Denver, Colo.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]

Edited by John de S. Coutinho.

Washington, Spartan Books, Inc., 1965, p. 553-577.

Description of the manufacturing reliability program established at Martin-Denver as an integrated part of the management framework to ensure that the manufacturing department achieves an acceptable degree of reliability. The manufacturing reliability operation basically consists of a three-phase program: (1) indoctrination of people; (2) action on potential and actual problems observed on hardware resulting from processes as a result of equipment or tooling, as well as problems created directly by people; and (3) continuous measurement of the critical manufacturing operations. Several examples are discussed to demonstrate the various areas of concentration on practical reliability. M.M.

A66-10099

QUALITY INNOVATIONS PROMOTE PRODUCT RELIABILITY.

L. G. C. Peirce (Martin Marietta Corp., Martin Co., Denver, Colo.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]
Edited by John de S. Coutinho.
Washington, Spartan Books, Inc., 1965, p. 579-584.

Brief discussion of the following five reliability motivating programs instituted by the quality department at Martin-Denver: (1) supplier quality assurance, (2) quality measurement of management effectiveness, (3) quality audit program, (4) reliability achievement program, and (5) incremental summary review. It is concluded that the effectiveness of these five programs has been exemplified by the record of consecutive Titan II and Titan III launch successes achieved during the last three years. M. M.

A66-10101

COST EFFECTIVENESS APPLIED TO PRODUCT ASSURANCE.

Henry Lehmann (General Electric Co., Missile and Space Div., Apollo Support Dept., Daytona Beach, Fla.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]
Edited by John de S. Coutinho.
Washington, Spartan Books, Inc., 1965, p. 591-596.

Consideration of problems arising in the implementation of reliability and quality programs. It is pointed out that a systematic review of all elements of a product-assurance program in terms of the costs of each element, and the enhancement in reliability and quality resulting therefrom reveal many opportunities to reduce product assurance costs. Primary opportunities result from current tendencies to require excessive documentation, to impose specifications which are too rigid for the intended use of the product and are in excess of contractual requirements, and to perform tasks because of habit rather than true need. The results of such a program can be seen by measuring the trend of product-assurance costs in the product and by recording the cost improvement projects which were initiated by product assurance personnel. Throughout the program, care must be given to ensure that the quality of the product as measured by customer satisfaction does not deteriorate, but improves. M. M.

A66-10105

COST CONSIDERATIONS IN LAUNCH OPERATIONS.

Joseph M. Verlander (Martin Marietta Corp., Martin Co., Canaveral Div., Cocoa Beach, Fla.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4- PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]
Edited by John de S. Coutinho.
Washington, Spartan Books, Inc., 1965, p. 661-667.

Discussion of the cost factors involved in launch operations. It is pointed out that the cost of a launch operation is controlled by the same management techniques and tools which are used in other facets of research and development. Significant differences are reflected in schedule and technical changes which occur during a normal vehicle checkout period. Trends in program management necessitate a more economical and efficient control of launch operations to maintain a sound corporate competitive position. The inability to recall the vehicle after launch defines reasons to adequately evaluate its capability to perform the assigned mission. Contractually, the technical performance represents a major incentive-award feature of present-day R and D contracts. Standardization of configuration and strict adherence to schedule represent two of the most significant reasons for controlling cost. It is noted that adherence to published budgets and the awareness by all levels of supervision of the importance of cost control, cost reduction and contractual performance are the major contributors to successful program management. M. M.

A66-10341

OPERATIONAL RESEARCH AND AVIATION MANAGEMENT. II - PROCUREMENT AND CAPITAL INVESTMENT PROGRAMMES.

P. A. Longton and A. T. Williams (Business Operations Research, Ltd., London, England).

Royal Aeronautical Society, Journal, vol. 69, Sept. 1965, p. 601-610. 22 refs.

Discussion of the profitable application of operational research to problems in the different branches of the aviation industry. Concentrating on capital investment programs and the procurement of aircraft, a discussion of cost structure leads to some detailed models. Objectives and financial policy, cost structure and investment costs, and some considerations for an aircraft replacement policy are given extensive attention. Problems of air traffic control and airport runways are considered. The analysis highlights the complexity of the interactions between system parameters in affecting the operations rate of the runway when it is used for both landings and takeoffs. The operations rate is affected differently by each parameter, depending on the values of the other parameters. Under all conditions, it is considered to be advantageous that the minimum time separation required between successive landings required at the runway, runway occupancy time of a landing aircraft, minimum time separation required between successive takeoffs, and minimum distance (from the approach end of runway) of a landing aircraft to permit interposing a takeoff before the landing, be as small as possible consistent with safety limitations. F. R. L.

A66-12706 #

STUDY ON OPTIMIZING AIRPORT RUNWAY DESIGN BY ECONOMIC ANALYSIS.

Tojiro Ishihara and Kazuhiro Yoshikawa (Kyoto University, Dept. of Civil Engineering, Kyoto, Japan).

Kyoto University, Faculty of Engineering, Memoirs, vol. 27, July 1965, p. 245-264. 9 refs.

Assessment of the capacity of airport runways by analyzing the delay to operations in order to plan more accurately for long-range development of adequate facilities. Mathematical models were developed that can be used in forecasting the operating rates of runways with associated delays. These models have been devised covering delays under preemptive priority type operations. The optimum runway design is considered to be that which will manage to maintain a balance between operating cost and total annual costs. The design is then determined by economic analysis of the factors that affect runway operations. An economic analysis is developed which could be used in determining the break-even volume. F. R. L.

A66-13686

CONTENT ADDRESSABLE MEMORY SYSTEM CONCEPTS.

A. V. Campi, B. H. Gray (U.S. Army, Electronics Command, Electronics Laboratories, Data Div., Fort Monmouth, N.J.), and R. M. Dunn (U.S. Army, Electronics Command, Electronics Laboratories, Fort Monmouth, N.J.).

IEEE Transactions on Aerospace and Electronic Systems, vol. AES-1, Oct. 1965, p. 168-173.

A formal descriptive definition of a computer memory which, because of inherent parallelism, data manipulative capability, and resulting speed advantage over conventional central processor memories, offers promise of providing substantial increases in computational capability for a large class of Army data-processing problems. The basic forte of this memory is its ability to search its entire contents in one unit cycle time for adherence of the stored data to the imposed search criteria. These storage systems are conventionally called content addressable memories (CAM's); today they represent an unstandardized concept with respect to their capabilities, applications, and organizations. A hierarchy (according to capability) of CAM's is developed; each new version possesses the characteristics of the previous, but incorporates a new sophistication, until the "full capability" CAM concept is developed. Finally, guidelines are established to evaluate the economic potential of various techniques suitable for the realization of a "full capability" CAM, and possible applications are investigated for inclusion in Army automatic data-processing and communications systems. (Author)

A66-14616

RECENT PSYCHOLOGICAL RESEARCH RELEVANT TO THE HUMAN FACTORS ENGINEERING OF MAN-MACHINE SYSTEMS.

Richard W. Pew (Michigan, University, Dept. of Psychology, Ann Arbor, Mich.).

IN: NATIONAL ELECTRONICS CONFERENCE, CHICAGO, ILL., OCTOBER 25-27, 1965, PROCEEDINGS. VOLUME 21.

[A66-14553 05-09]

Conference sponsored by the Illinois Institute of Technology, the Institute of Electrical and Electronics Engineers, Northwestern University, the University of Illinois, Argonne National Laboratory, Electronic Representatives Association, Scientific Apparatus Makers Association, the Society of Motion Picture and Television Engineers, Iowa State University, Marquette University, Michigan State University, the University of Minnesota, Purdue University, the University of Michigan, the University of Notre Dame, Ohio State University, and the University of Wisconsin.

Chicago, National Electronics Conference, Inc., 1965, p. 678-682. 14 refs.

Contracts No. AF 49(638)-1235; No. AF 33(615)-1817.

Review of recent psychological studies of human performance capabilities which are of interest in the design of man/machine interfaces. The human information-processing system is discussed, and the rates of information handling in the central human decision-making subsystem are examined for different classes of information-processing tasks. Methods for incorporating the results of these studies into man/machine system design are discussed. P. K.

A66-15827

PRODUCT RELIABILITY MANAGEMENT.

W. K. Warner (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).

IN: RELIABILITY IN SPACE VEHICLES; SEMINAR, 5TH, LOS ANGELES, CALIF., APRIL 2, 1965, PROCEEDINGS.

[A66-15823 05-31]

Seminar sponsored by the Los Angeles Section, Component Parts and Reliability Groups of the Institute of Electrical and Electronics Engineers.

Edited by C. E. Roth, Jr.

Elizabeth, N. J., Engineering Publishers, 1965, p. 55-67.

Observation that the management or control of product reliability necessarily involves the management of people and control of their activities which affect the product. Reasons for failing to achieve high reliability in the management of space system projects are discussed. It is considered to be possible to define product analysis and product review methods which take into account all the factors affecting product reliability. If followed rigorously these methods provide the knowledge of what needs to be done, what is being done, and the basis for management capability of regulating the doing process. F. R. L.

A66-17068

MANUFACTURING METHODS IN SPACE FLIGHT TECHNOLOGY; GERMAN ASSOCIATION FOR ROCKET TECHNOLOGY AND SPACE FLIGHT, SYMPOSIUM, MUNICH, WEST GERMANY, NOVEMBER 12, 1964 [FERTIGUNGSMETHODEN IN DER RAUMFAHRTTECHNIK; DEUTSCHE GESELLSCHAFT FÜR RAKETENTECHNIK UND RAUMFAHRT, SYMPOSIUM, MUNICH, WEST GERMANY, NOVEMBER 12, 1964].

Munich, Deutsche Gesellschaft für Raketentechnik und Raumfahrt, 1965. 198 p. In German and English.

CONTENTS:

FOREWORD. 1 p.

THE PRODUCTION OF LARGE TANKS FOR CRYOGENIC FUELS. E. Harpoothian (Douglas Aircraft Co., Inc., Santa Monica, Calif.), p. 7-43. [See A66-17069 06-15]

THE DESIGN AND PRODUCTION OF THE BLUE STREAK STRUCTURE. R. C. Godwin (Hawker Siddeley Dynamics, Ltd., London, England), p. 45-60. [See A66-17070 06-15]

DEFORMATION TECHNIQUES FOR WORKING THIN SHEETS OF HIGH-STRENGTH TITANIUM ALLOYS [VERFORMUNGSVERFAHREN BEI DER VERARBEITUNG DÜNNER BLECHE HOCHFESTER TITANLEGIERUNGEN]. H. Kossira and E. Loechelt (Vereinigte Flugtechnische Werke GmbH, Bremen, West Germany), p. 61-88. [See A66-17071 06-15]

APPLICATION OF ELECTRON BEAM TECHNIQUES FOR IN-SPACE FABRICATION. F. R. Schollhammer (United Aircraft Corp., Windsor Locks, Conn.), p. 89-110. 16 refs. [See A66-17072 06-15]

MAGNETIC PULSEFORMING OF THIN SHEETS [MAGNETISCHE PULSFORMUNG VON DÜNNEN BLECHEN]. J. Hurlimann (General Dynamics Corp., San Diego, Calif.), p. 111-125. [See A66-17073 06-15]

A66-19534

APPLICATIONS OF MAN-MACHINE SIMULATION IN SYSTEM DEVELOPMENT.

J. A. Kraft and R. L. Martindale (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL EAST COAST CONFERENCE ON AEROSPACE AND NAVIGATIONAL ELECTRONICS, 12TH, BALTIMORE, MD., OCTOBER 27-29, 1965. TECHNICAL PAPERS. [A66-19487 08-21]

Conference sponsored by the Baltimore Section of the Institute of Electrical and Electronics Engineers, and the Aerospace and Navigational Electronics Group.

New York, Institute of Electrical and Electronics Engineers, 1965, p. 3.2.4-1 to 3.2.4-6.

Discussion of considerations for the design of simulators which include man in the system. Such simulators can be used for personnel training as well as for research on human behavior and performance and on man/machine interactions. The needs in a simulation program for flexibility of purpose and for adequate fidelity to the system being simulated are discussed. P. K.

A66-22050

ADVANCED DATA MANAGEMENT EXPERIMENT.

A. C. Foreman (USAF, Systems Command, Electronic Systems Div., Hanscom Field, Mass.).

IEEE Transactions on Aerospace and Electronic Systems, vol. AES-2, Jan. 1966, p. 115-120.

Account of a project to demonstrate and refine a computer programing concept known as Generalized Data Management as exemplified by the Advanced Data Management (ADAM) System developed by the MITRE Corporation for the Electronic Systems Division/MITRE Systems Design Laboratory. ADAM is designed to provide generalized routines for functions common to a large class of command and management problems. Although earlier implementations of the Generalized Data Management concept have been demonstrated, ADAM has not been demonstrated in an operational application. The Air Force Logistics Command has provided an application (category I and IIR Consumption Item Requirements Computation System) with which to test ADAM. The Requirements System provides Logistics Command managers with information concerning stock items to buy, procurement contracts to terminate, items to repair, and budgets. ADAM implementation will provide an on-line real-time information system; the present Requirements System operates in a nonreal-time batch processing mode. The usefulness of providing an on-line system, which can be easily modified, is evaluated. (Author)

A66-22181

QUALITY AUDIT - AN EFFECTIVE MANAGEMENT TOOL.

P. S. Reis and S. I. Fahrenbruch (Aerojet-General Corp., Sacramento, Calif.).

Industrial Quality Control, vol. 22, Feb. 1966, p. 402-407. 7 refs.

The basic quality audit concept and the methods and considerations by which it is used as an effective management tool is specifically discussed. Details of the article include: (1) use of an impartial team of auditors who have no specific line responsibilities; (2) development and distribution of audit reports; (3) methods which are used for weighting nonconformancies detected during the audit; (4) practices employed to obtain corrective action for nonconformancies detected during the audit; (5) placement of the audit function in the organization structure to ensure maximum effectiveness in operation with the related quality systems and training functions; (6) desired working relationship between audit personnel and affected managerial personnel and the importance for managers to view the audit effort as a support function rather than a disciplinary force; (7) the qualifications required by an individual to be selected as an auditor. The article concludes with an explanation of a quality audit and how it can be compared in need and principle to the more widely known accounting audit. (Author)

A66-23176

DESIGN TECHNIQUES EMERGING FROM MAN-COMPUTER GRAPHIC COMMUNICATION.

S. H. Chasen (Lockheed Aircraft Corp., Lockheed-Georgia Co., Research Laboratory, Marietta, Ga.).

(American Federation of Information Processing Societies, Fall Joint Conference, Las Vegas, Nev., Nov.-Dec. 1965, Paper.)

Machine Design, vol. 38, Mar. 3, 1966, p. 145, 148, 150.

Description of a real-time on-line computer graphics system, which has been made practicable with recent advances in computer speed and scope performance. The development of the system was based on experience gained when a Univac 418 computer was connected to a Digital Equipment Corp. 340 scope. The existing capabilities are both three- and two-dimensional. Long-range applications emphasize the design process. Two near-term investigations deal with complete mathematical definition of all surfaces of an aircraft envelope and two-dimensional numerical-control milling procedures. F. R. L.

A66-23436 #
THE NAVY CONCEPT OF SYSTEMS EFFECTIVENESS.
I. J. Galantin (U.S. Naval Material Support Establishment, Washington, D.C.).
IN: ELECTRONIC INDUSTRIES ASSOCIATION, CONFERENCE ON SYSTEMS EFFECTIVENESS, 1ST, WASHINGTON, D.C., OCTOBER 19, 20, 1965, PROCEEDINGS. [A66-23434 11-34]
Washington, D.C., Electronic Industries Association, 1965, p. 10-18.

Evaluation of the methodology of systems effectiveness based upon a combination of reliability, maintainability, value, safety, and human engineering disciplines. The concepts employed in such an evaluation include mathematical models, system synthesis, and operations research. Criteria for systems effectiveness are considered in the light of the excellent performances of the Polaris program. It is shown how the concept of systems effectiveness can resolve the apparent conflict between a number of possible optimization criteria for a given system, such as greater reliability, least cost, minimum personnel required, or minimum construction time. D.P.F.

A66-23439 #
COST EFFECTIVENESS.
G. R. Herd (Kaman Aircraft Corp., Bloomfield, Conn.).
IN: ELECTRONIC INDUSTRIES ASSOCIATION, CONFERENCE ON SYSTEMS EFFECTIVENESS, 1ST, WASHINGTON, D.C., OCTOBER 19, 20, 1965, PROCEEDINGS. [A66-23434 11-34]
Washington, D.C., Electronic Industries Association, 1965, p. 78-85.

The paper discusses cost effectiveness as an analytical tool for engineering and management. It identifies the tasks and inputs that should be included in an analysis. Cost data are discussed as well as the risks and uncertainties involved in the costing. The cautions and limitations involved in interpreting and implementing the results are presented along with the benefits of the approach. Simple examples are used to illustrate the various ideas. (Author)

A66-23441 #
ACHIEVING SYSTEMS EFFECTIVENESS BY DESIGN FUNCTION MANAGEMENT.
N. I. Hall (Hughes Aircraft Co., Culver City, Calif.).
IN: ELECTRONIC INDUSTRIES ASSOCIATION, CONFERENCE ON SYSTEMS EFFECTIVENESS, 1ST, WASHINGTON, D.C., OCTOBER 19, 20, 1965, PROCEEDINGS. [A66-23434 11-34]
Washington, D.C., Electronic Industries Association, 1965, p. 97-101; Panel Discussion, p. 106-117.

Discussion of the manner in which design activity can affect systems effectiveness. In order for the design function to be programed and managed, decision guide activities - including design analysis, development tests, application of standards and checklists, and use of consultants - must be systematically identified. The steps required to ensure a proper choice of components and materials for electronic devices are outlined. The concepts of design and system review are considered. System effectiveness is defined as capability times availability times dependability. D.P.F.

A66-23444 #
SECTARIANISM AND SYSTEMS EFFECTIVENESS.
George E. Fouch (Department of Defense, Office of the Secretary of Defense, Washington, D.C.).
IN: ELECTRONIC INDUSTRIES ASSOCIATION, CONFERENCE ON SYSTEMS EFFECTIVENESS, 1ST, WASHINGTON, D.C., OCTOBER 19, 20, 1965, PROCEEDINGS. [A66-23434 11-34]
Washington, D.C., Electronic Industries Association, 1965, p. 163-168.

The advantages and disadvantages of specialties within the framework of systems effectiveness are discussed in this paper. Arguments are offered for both their existence and their abolition. The speaker recognizes the need to introduce into production the latest achievements of science and technology, and the problem, as presented here, is to make certain that these cults (such as quality control, reliability, value engineering, etc.) do not become the end in themselves but rather that they are harmoniously accommodated and efficiently inculcated into the facets of development, production and maintenance. Techniques must be objectives rather than means. (Author)

A66-23831
MANAGEMENT PROBLEMS OF AN AEROSPACE COMPUTER CENTER.
G. A. Garrett (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).
IN: AMERICAN FEDERATION OF INFORMATION PROCESSING SOCIETIES, 1965 FALL JOINT COMPUTER CONFERENCE, LAS VEGAS, NEV., NOVEMBER 1965, PROCEEDINGS. VOLUME 27 - PART I. [A66-23824 12-08]
Washington, D.C., Spartan Books, 1965, p. 129-137.

Discussion of technical facets of the direction of a large aerospace computer installation. Some of the figures available on the actual costs of change are considered, together with aspects of the turn-around problem, from the management standpoint. Remarks are offered on the reasonable future expectations of the computer center considered. M.M.

A66-24414
WHAT'S NEW WITH LINE OF BALANCE.
Norman E. Finck (Douglas Aircraft Co., Inc., Long Beach, Calif.).
American Society of Tool and Manufacturing Engineers, and American Society for Metals, Western Metal and Tool Conference, Los Angeles, Calif., Mar. 7-11, 1966, Preprint MM66-703. 15 p.
Members, $0.75; nonmembers, $1.00.

Discussion of the following two variations generated by the continued use of the method of line-of-balance charting: (1) the first is an ability to display configurated or nonrepetitive items along with a basic repetitive release on the same line-of-balance chart. This is claimed to be most helpful when all customers get the same basic items in the finished product which has been altered in certain areas to suit the customer; and (2) the second variation applies to a first article or prototype effort and shows in line-of-balance fashion when each "milestone" or event should be completed along with the time when each milestone should have started. This version readily discloses if an organization is working on the right things at the right time and if the events were started on time. M.M.

A66-24416
STANDARDIZATION OF MACHINING CRITERIA FOR CURRENT AEROSPACE MATERIALS.
Willis L. Carr (North American Aviation, Inc., Rocketdyne Div., Canoga Park, Calif.).
American Society of Tool and Manufacturing Engineers, and American Society for Metals, Western Metal and Tool Conference, Los Angeles, Calif., Mar. 7-11, 1966, Preprint MM66-714. 10 p.
Members, $0.75; nonmembers, $1.00.

Discussion of the standardization of machining criteria for aerospace materials required to provide a sound basis for establishing efficient manufacturing techniques. It is noted that such standardization, commensurate with in-house capabilities and requirements, can greatly reduce expensive tool failures that are caused by improper tool design or application. These data should be developed for each of the various types of machining operations relative to the various groups of work materials and with consideration for the many machining variables pertinent to a particular company. Compilation of these data into a simple form can provide rapid assistance to tool design, planning, standards, manufacturing, and purchasing departments in developing manufacturing costs. M.M.

A66-24669
SETTING RELIABILITY INCENTIVES USING LINEAR PROGRAMMING.
R. Maloney (Sperry Rand Corp., Sperry Gyroscope Co., Information and Communications Div., Great Neck, N.Y.).
(Institute of Electrical and Electronics Engineers, International Convention, New York, N.Y., Mar. 21-25, 1966, Paper.)
IEEE International Convention Record, vol. 14, pt. 9, 1966, p. 119-124.

Discussion of an alternative method of determining an incentive fee schedule for government contracts based on linear programing techniques. It is noted that the present method of determining an incentive fee schedule for reliability reduces much of the subjective elements generally present in determining incentive schedules, and requires only four subjective quantities. With these data, a fee-vs-failure schedule can be determined very easily using linear programming techniques. The technique has only been used for fixed time tests. It is pointed out that, since many reliability tests are performed sequentially, it may be useful to try and apply the technique to sequential tests. M.M.

A66-24957
ALERTNESS MANAGEMENT IN INDUSTRY.
J. A. Moody and B. C. Duggar (Bio-Dynamics, Inc., Cambridge, Mass.).
(American Industrial Hygiene Association, Annual Meeting, 26th, Houston, Tex., May 3-7, 1965, Paper.)
American Industrial Hygiene Association, Journal, vol. 27, Jan.-Feb. 1966, p. 17-24. 35 refs.
Contract No. NASw-904.

Study of alertness management which is critical to production rate, quality control and operator safety. Alertness management includes (1) elimination of factors conducive to alertness decrement, (2) addition of conditions or procedures which enhance alertness, (3) reduction of the consequences of alertness decrements, and (4) personnel monitoring when necessary. The criteria for evaluating the controlling elements in the task, physical environment, social environment, and procedures which may lead to decrements in alertness are discussed. Monitoring procedures are described and recommendations suggested which should lead to improved alertness management in the industrial situation. An alertness checklist is presented for use in analysing particular job situations. M.F.

A66-25238 #
A SYSTEMS APPROACH TO MISSION PLANNING FOR MANNED MARS EXPLORATION.
Walter M. Hollister (Massachusetts Institute of Technology, Dept. of Aeronautics and Astronautics, Cambridge, Mass.).
IN: AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, AND AMERICAN ASTRONAUTICAL SOCIETY, STEPPING STONES TO MARS MEETING, BALTIMORE, MD., MARCH 28-30, 1966. TECHNICAL PAPERS. [A66-25234 13-30]
New York, American Institute of Aeronautics and Astronautics, 1966, p. 30-34. 9 refs.

The important characteristics involved in the management of large physical systems are established in general. Mission planning for manned Mars exploration is introduced as an example of the general discipline. It is shown that the characteristics of mission planning which require the most improvement are the interacting operations of process optimization, data presentation, and human judgment. A suggested improvement in the interface between the electronic computer and human judgment is outlined. It would allow the systems engineer to carry out a plain language conversation with the computer from a time-sharing console. The computer would perform the complex mathematical optimizations based on the human judgments of the operator. In this manner the systems engineer can benefit from the advantages of modern optimization techniques without being an expert in computer programing, celestial mechanics, or advanced mathematics. He contributes only his engineering judgment. Education for systems engineering is discussed briefly. (Author)

A66-26033 #
EVALUATING R&D EFFECTIVENESS.
George T. Buck (USAF, Systems Command, Research and Technology Div., Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio).
Astronautics and Aeronautics, vol. 4, Apr. 1966, p. 86-88.

Description of a program (called RDE) for evaluating the effectiveness of research and development programs. The program, which uses analog computer methods, was developed at the Air Force Flight Dynamics Laboratory (AFFDL). The ways in which RDE is used at AFFDL to help determine the allocation of resources to various R&D projects is outlined. R.A.F.

A66-26391
A PRACTICAL DATA PROCESSING APPROACH FOR ACHIEVING EFFECTIVE MANAGEMENT CONTROL OF AIRCRAFT MANUFACTURE.
Ben Gebhardt (Mooney Aircraft, Inc., Kerrville, Tex.).
Society of Automotive Engineers, Business Aircraft Conference, Wichita, Kan., Mar. 30-Apr. 1, 1966, Paper 660205. 9 p.
Members, $0.75; nonmembers, $1.00.

Review of a system application of data processing for offsetting costly inefficiencies of the aircraft industry, developed from "ideal" operating concepts. The theory behind the system development is outlined, and the critical control procedures and objective operating results achieved are identified. M.M.

A66-26699
DECISION THEORY AND THE SHAPE OF STRUCTURES.
R. F. D. Porter Goff (Leicester, University, Dept. of Engineering, Leicester, England).
Royal Aeronautical Society, Journal, vol. 70, Mar. 1966, p. 448-452. 11 refs.

Application of decision theory to the design of engineering structures. It is pointed out that engineering structures are usually designed to minimize weight or some other cost criterion, subject to specified loading and functional conditions being met. It is shown that the techniques of decision theory may be applied if the cost can be described mathematically in terms of the design variables. Specifically, dynamic programing may be applicable to design for which the parameter values can be derived sequentially. Dynamic programing is introduced to obtain minimum weight layouts for two types of cantilever structure, and comparisons are made with known Michell solutions. Results suggest that other near-optimum configurations could be systematically derived under conditions less restrictive than those assumed by the Michell theory. M.L.

A66-26958
DEVELOPMENT AND USE OF MACHINABILITY DATA FOR PRESENT DAY AEROSPACE MANUFACTURING.
Robert L. Vaughn (Lockheed Aircraft Corp., Lockheed-California Co., Burbank, Calif.).
American Society of Tool and Manufacturing Engineers, Annual Engineering Conference and Tool Exposition, Detroit, Mich., Apr. 18-22, 1966, Paper MM66-178. 38 p.
Members, $0.75; nonmembers, $1.00.

Examination of the machinability data development and use for today's "hard-to-machine" materials. It is shown that significant cost reductions and removal rate increases can result (and have resulted) from the expansion of existing techniques and functions. The tool holder test program and the cutting tool and cutting fluids test program are reviewed. Workpiece and fixtures as factors in machinability data development are studied. The significant producibility methods functions determined to date are diagramed and their relationship at each function to the best cost position is indicated. The interpretation and use of machinability data are discussed and occupations affected by training are listed. New products and processes are described. M.F.

A66-27301
MANUFACTURING ENGINEERING - A PARTNER IN ADVANCED DESIGN.
L. R. Glassburner (Beech Aircraft Corp., Wichita, Kan.).
Society of Automotive Engineers, National Aeronautic Meeting, New York, N.Y., Apr. 25-28, 1966, Paper 660324. 6 p. 9 refs.
Members, $0.75; nonmembers, $1.00.

Study aimed at observing the developmental trends in the aerospace industry and relating them to the various manufacturing engineering programs established to develop comprehensive plans and controls necessary to translate the product design into a practical and economical manufacturing operation. It is seen that successful development and introduction of new products is a matter of enlightened step-by-step planning accomplished in cooperation with the product designer early in the product phase. V.P.

A66-28435 #
CAPABILITY MANAGEMENT - AN APPROACH TO SELLING RESEARCH AND DEVELOPMENT.
Salvatore F. Divita (International Business Machines Corp., Federal Systems Div., Washington, D.C.).
IN: THE CHALLENGE OF SPACE; PROCEEDINGS OF THE THIRD SPACE CONGRESS, COCOA BEACH, FLA., MARCH 7-10, 1966. [A66-28401 14-30]
Congress sponsored by the Canaveral Council of Technical Societies. Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1966, p. 427-432.

Review of the current approach to selling research and development (R and D) and an attempt to relate it to the workings of related marketing areas. Some fundamental shortcomings of the current practice are pointed out, and a new approach is suggested to the problem. A new concept is introduced in the approach to marketing R and D capabilities to the defense/space market which is based primarily on establishing capability managers as the focal point of the managing function. It is suggested that this is only one of the several new concepts that are needed to meet the challenges of marketing. B.B.

A66-28790 #
THE ECONOMY OF NUMERICAL CONTROL INSPECTION.
William F. Hunt (Northrop Corp., Norair Div., Hawthorne, Calif.).
IN: AMERICAN SOCIETY FOR QUALITY CONTROL, ANNUAL TECHNICAL CONFERENCE, 19TH, LOS ANGELES, CALIF., MAY 3-5, 1965, TRANSACTIONS. [A66-28788 15-15]
Milwaukee, Wis., American Society for Quality Control, Inc., 1965, p. 31-35.

Brief study of the advantages of numerical control methods of inspecting complex machine tools and parts. A precision coordinate measuring machine used by the Pratt and Whitney Co. is described, and the Sheffield Ferranti coordinate measuring machine is discussed. It is believed that coordinate measuring machines have definite advantages in the areas of economy and accuracy for inspecting complex machine tools and parts. B. B.

A66-28793 #
A CONCEPTUAL MODEL OF GENERAL APPLICATION TO THE INDUSTRIAL QUALITY CONTROL PROBLEM.
L. F. Morgan (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Space Systems Div., Sunnyvale, Calif.).
IN: AMERICAN SOCIETY FOR QUALITY CONTROL, ANNUAL TECHNICAL CONFERENCE, 19TH, LOS ANGELES, CALIF., MAY 3-5, 1965, TRANSACTIONS. [A66-28788 15-15]
Milwaukee, Wis., American Society for Quality Control, Inc., 1965, p. 59-76.

Demonstration that the industrial quality control problem can be usefully generalized and a standard conceptual model established. It is thought that the model, when properly implemented, is capable of satisfying company management goals as well as customer requirements, and that a need exists for mechanization and associated standardization of techniques which dictate an increased quantification of system control parameters. Examples of how this might be done are developed for several areas of common interest to quality control organizations. It is concluded that quality control system effectiveness can be measured and related to the overall company learning curve. B. B.

A66-28802 #
A PROGRAM OF PRODUCT QUALITY ASSURANCE.
F. A. Lally (Hughes Aircraft Co., Components Group, Electronic Products Div., Newport Beach, Calif.).
IN AMERICAN SOCIETY FOR QUALITY CONTROL, ANNUAL TECHNICAL CONFERENCE, 19TH, LOS ANGELES, CALIF., MAY 3-5, 1965, TRANSACTIONS. [A66-28788 15-15]
Milwaukee, Wis., American Society for Quality Control, Inc., 1965, p. 286-290.

Outline of a realistic and valid means of achieving a specified product quality assurance through a program of quality control applicable to the systems under examination. This program consists of four distinct phases - (1) designation of critical parameters, (2) determination and control of rejection occurrence, (3) process control and capability, and (4) preventive and corrective action. A ten-step method for determining process capability and compatibility which is applicable to processes relating to the manufacture of electronic components is presented. D. P. F.

A66-33947
THE MANAGEMENT OF COST REDUCTION - METHOD OR MYTH?
H. Davies (Thiokol Chemical Corp., Reaction Motors Div., Denville, N.J.).
Royal Aeronautical Society, Journal, vol. 70, June 1966, p. 639-648. 15 refs.

Examination of the general framework of business profitability and review of a number of the possibilities for practical cost reduction within the field of the aerospace industry. The business profitability model is described and cost effectiveness is studied. The U.S. Department of Defense cost reduction program is reviewed. Possible approaches to cost reduction are reviewed including program management and control, design and process cost studies, value analysis, competitive purchasing, operational research, the statistical design of experiments, operations auditing, natural productivity increases, investment analysis, and zero defects. M.F.

A66-30400
AN ANALYTICAL CONCEPT FOR THE SELECTION, FLOW, AND TRANSFERENCE OF TECHNOLOGY IN A LARGE ELECTRONICS/AEROSPACE FIRM.
Robert R. Kley (Technology Planning Center, Inc., Ann Arbor, Mich.
IEEE Transactions on Engineering Management, vol. EM-13, Mar. 1966, p. 21-36.

The basic functions of any firm can be separated into planning, control, and operations, the time span of decision being the separating variable. In the planning sector, the three basic factors of importance are the methodologies and concepts used to relate and integrate corporate strategy, structure, and policies. As the physical size of a firm changes, possibly accompanied by shifts in customer and market orientation, the combinations of strategy, structure, and policies change. In the electronics/aerospace industry, these three factors readily translate into (1) a process for selecting market areas as well as developing a technological resource base for a firm, and (2) a process of ensuring that this technological activity is embedded in an environment which will permit an intrafirm flow and transference of technology. For the selection process, a method is presented which develops a technique for establishing a physical cross-sectoral relationship between the military and commercial markets using a unique tree diagram and matrix approach. A related concept for developing technological flow and transference is developed using a Shannon-Weaver communication model. A composite organization structure model correlating all of these factors is also developed using a small group behavior, linking pin, and decision model. (Author)

A66-30441
TESTING FACILITIES - POTENTIAL PROFITMAKERS?
K. J. Dell (Bunker-Ramo Corp., Defense Systems Div., Information Technology Laboratory, Test Facilities Dept., Canoga Park, Calif.).
IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, SAN DIEGO, CALIF., APRIL 13-15, 1966, PROCEEDINGS. [A66-30434 16-11]
Mt. Prospect, Ill., Institute of Environmental Sciences, 1966, p. 49-54.

Discussion of factors entering into the disposition of capital equipment and facilities devoted to environmental testing. It is illustrated that through analysis of existing facilities and the needs of the surrounding technical community a profitable utilization of unneeded facilities can be achieved. Some of the more frequent causes of work-load reorientation that can undermine the need for capital test facilities are discussed, and an analysis is made of the management alternatives regarding the disposition of the affected facilities. The facets of implementation that would face responsible department management are explored on the basis of a management decision to proceed with a commercial laboratory operation. An attempt is made to illustrate by example the areas in which economies can be effected so as to make the laboratory more competitive in the commercial market place. A. B. K.

A66-34064
STUDIES OF THE PROBLEM-SOLVING PROCESS IN ENGINEERING DESIGN.
Thomas J. Allen (Massachusetts Institute of Technology, Alfred P. Sloan School of Management, Cambridge, Mass.).
(Institution of Electrical Engineers, Conference on Electronics Design, London, England, Feb. 8, 9, 1965, Paper.)
IEEE Transactions on Engineering Management, vol. EM-13, June 1966, p. 72-83. 7 refs.
NSF Grants No. GN-233; No. GN-353; Grant No. NsG-235-62.

Three sets of parallel research and development projects are examined. The data analyzed were gathered by means of Solution Development Records - a form which provides a weekly estimate of the probability of adoption of the approaches under consideration as possible solutions to a technical problem. It is found that the longer an approach is held in a favored position, the more difficult it is to reject. Furthermore, the number of alternative technical approaches considered bears a relation to judged solution quality. Groups producing higher rated solutions generated fewer approaches during the course of the project, and they more closely approach an ideal strategy of trading approaches off on a two-at-a-time basis than do their poorer performing rivals. The selection of technical information sources by the engineers and scientists is found to be dependent upon the function to be performed and related to the particular time phase in which the project happens to be. (Author)

A66-34065
TOTAL EVALUATION FOR MANAGEMENT PURPOSES OF ENGINEERING AND SCIENTIFIC TASKS.
Lazarus Lebanoff (NASA, Kennedy Space Center, Delta Operations Branch, Western Test Range, Lompoc, Calif.).
IEEE Transactions on Engineering Management, vol. EM-13, June 1966, p. 110-122. 13 refs.

Analysis of a system for reporting to management on the progress of scientific and engineering projects. The hypothesis on which the study is based is that critical elements of information affecting technical projects can be isolated and meaningful quantitative measures of them can be established to assess technical progress. It is confirmed that an analysis procedure can be developed for transmutation of the quantified data into meaningful indicators for management. B.B.

A66-35534 #
INDEPENDENT RESEARCH MANAGEMENT.
R. J. McNair and F. C. Shadley (Avco Corp., New York, N.Y.).
IN: NAECON/66; PROCEEDINGS OF THE ANNUAL NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 18TH, DAYTON, OHIO, MAY 16-18, 1966. TECHNICAL PAPERS. [A66-35501 19-21]
Conference sponsored by the Dayton Section of the Institute of Electrical and Electronics Engineers.
Dayton, Ohio, Institute of Electrical and Electronics Engineers, 1966, p. 343-345.

Study of the management approach used by Avco Corporation, Electronics Division, to implement and manage its independent research effort. There, the independent research effort is defense-oriented and centers on communication and IR technologies. Factors discussed include experience, personnel, facilities, and available funding. M.F.

A66-36179
HUMAN PERFORMANCE.
John W. Senders (Bolt, Beranek, and Newman, Inc., Cambridge; Brandeis University, Waltham, Mass.).
International Science and Technology, July 1966, p. 58-60, 62, 64, 66-68, 89, 90.

Study of the limits of human performance and of the interaction of man and the machine he operates. The outer boundaries of human performance are reviewed. One set of boundaries is generated by the physical structure of man, another by the details of his physiology, and the third by the mathematical/logical nature of his task. This is illustrated by the task of driving an automobile or of piloting an aircraft. Isolated human functions such as vision and audition are taken into account. The attitude of the human operator toward the task is also a vital factor. The importance of perception in learning is stressed and man's capacity for error is reviewed. M.F.

A66-37732
A SELECTED ANNOTATED BIBLIOGRAPHY ON R & D MANAGEMENT.
L. N. Goslin (Indiana University, Graduate School of Business, Bloomington, Ind.).
Bloomington, Ind., Indiana University, Graduate School of Business, Bureau of Business Research (Indiana Business Information Bulletin no. 56), 1966. 204 p.
$3.25.

A book containing a bibliography on various aspects of R & D management with book abstracts. Among the subjects covered are allocation of resources, budgeting, communication, control, creativity, decision making, economics, evaluation of results, expenditures, motivation, objective, organization, patents, philosophy, planning, project selection, responsibility, strategy and tactics, system, and theory. V.Z.

A66-37892 #
ARMNET - A QUANTITATIVE APPROACH TO THE EVALUATION OF MAN-MACHINE SYSTEM AVAILABILITY.
L. M. Crumley and M. A. Wilson (General Electric Co., Missile and Space Div., Re-Entry Systems Dept., Philadelphia, Pa.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY. VOLUME 5 - ACHIEVING SYSTEM EFFECTIVENESS; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 5TH, NEW YORK, N.Y., JULY 18-20, 1965, PAPERS. [A66-37879 20-15]
Conference sponsored by the American Institute of Aeronautics and Astronautics, the Society of Automotive Engineers, and the American Society of Mechanical Engineers.
New York, American Institute of Aeronautics and Astronautics, 1966, p. 112-115.

Description of a maintainability prediction method to enable program managers to effectively evaluate and control the availability characteristics of systems. It is shown that the strong points of the "human factors" approach and the mathematical-model approach to this problem can be combined by using a network approach similar to PERT analysis to define the maintenance environment. The kinds of data and the nature of the mathematical manipulations which can be considered with the aid of PERT-type networks are illustrated. A.B.K.

A66-37910 #
SYSTEMS ANALYSIS FOR SPACE PROGRAMS.
R. A. Dunlap and J. K. O'Keefe (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY. VOLUME 5 - ACHIEVING SYSTEM EFFECTIVENESS; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 5TH, NEW YORK, N.Y., JULY 18-20, 1965, PAPERS. [A66-37879 20-15]
Conference sponsored by the American Institute of Aeronautics and Astronautics, the Society of Automotive Engineers, and the American Society of Mechanical Engineers.
New York, American Institute of Aeronautics and Astronautics, 1966, p. 286-294. 5 refs.

Discussion of the basic concepts and scope of systems analysis in the design of space systems in terms of the elements and activities of the analysis effort. Reliability and maintainability are examined in terms of their relationship to systems analysis and their importance in the selection of design concepts and requirements which achieve the best system. M.M.

A66-37918 #
DESIGN REVIEW - PROFIT OR LOSS?
John T. Deden (TRW, Inc., TRW Systems Group, Redondo Beach, Calif.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY. VOLUME 5 - ACHIEVING SYSTEM EFFECTIVENESS; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 5TH, NEW YORK, N.Y., JULY 18-20, 1965, PAPERS. [A66-37879 20-15]
Conference sponsored by the American Institute of Aeronautics and Astronautics, the Society of Automotive Engineers, and the American Society of Mechanical Engineers.
New York, American Institute of Aeronautics and Astronautics, 1966, p. 393-397. 10 refs.

Consideration of examples demonstrating that the primary reason for design reviews is that they have proven to be a worthwhile technique for achieving end products. It is pointed out that design reviews can and have resulted in both profit and loss. Loss-type reviews occur primarily as a result of inattentive top-line management or project management, ineffective placement of an assignment of authority to the design review function, or through failure of the review program to fulfill specified requirements. Secondary loss occurs when reviews (1) are held on an untimely basis, (2) lack the control authority over design releases, and (3) are improperly managed, staffed or conducted. Profit-type reviews occur when up-to-date and dynamic management is applied, when positive activities with data retention, evaluation, and control are applied, and when the design review activity performs both monitor and control functions fulfilling its reason for being. M.M.

A66-38482 #

THE ECONOMICS OF A ZERO OR MINIMUM DEFECTS PROGRAM.
William Page Wood (Martin Marietta Corp., Martin Co., Reliability, Test and Evaluation Div., Orlando, Fla.).
American Society of Mechanical Engineers, Design Engineering Conference and Show, Chicago, Ill., May 9-12, 1966, Paper 66-MD-26. 9 p. 10 refs.
Members, $0.75; nonmembers, $1.50.

Description of the basic principles of the zero-defects concept. The zero-defects program initiated by the Martin Company in 1962 resulted in a 54% reduction in manufactured-hardware defect rates in the first year. Dollar savings are estimated at about $2 million. The costs of implementing the zero-defects concept at the company are discussed. **M. F.**

A66-38498 #

MANAGEMENT OF ENGINEERING CHANGES.
Walter Veith (Pan American World Airways, Inc., Guided Missiles Range Div., Patrick AFB, Fla.).
American Society of Mechanical Engineers, Design Engineering Conference and Show, Chicago, Ill., May 9-12, 1966, Paper 66-MD-69. 9 p. 6 refs.
Members, $0.75; nonmembers, $1.50.

This paper discusses the practical aspects of configuration management. It outlines the basic requirements for change identification, control, implementation, and accounting for typical engineering/manufacturing organizations regardless of size and specific customer requirements. It then develops criteria for implementation of an effective configuration-management framework within which through modular expansion or contraction, organizational dynamics and changing customer requirements can be accommodated. **(Author)**

A66-39516

HISTORY AND MANAGEMENT OF THE LEM PROGRAM IN RCA.
F. J. Gardiner (Radio Corporation of America, Defense Electronic Products, Aerospace Systems Div., LEM Program Office, Burlington, Mass.).
IN: THE LEM PROGRAM AT RCA.
Camden, N.J., Radio Corporation of America, 1966, p. 2-4.

Brief history of the RCA participation in the Lunar Excursion Module (LEM) program. Early RCA Apollo mission studies and initial assignments are discussed. Program management techniques and observations of RCA are outlined, and several factors found to be important to successful program operation are specified. B.B.

A66-41047 #

NASA MANAGEMENT AT THE CROSSROADS.
S. Peter Kaprielyan.
Aerospace Management, vol. 1, Summer 1966, p. 3-11.

Attempt to delineate NASA's management challenge as viewed broadly from top echelon. NASA's budgetary problems are sketched, and managerial successes, challenges, and problems are briefly discussed. The controversy of the incentives system in industrial contracting is reviewed, and the trend toward maximizing competition is stressed. S.Z.

A66-41048 #

ESRO'S MONUMENTAL CHALLENGE - MANAGING INTERNATIONAL SPACE RESEARCH.
Aerospace Management, vol. 1, Summer 1966, p. 13-19.

Review of the ESRO mission, organizational structure, and its plans and programs. Procedures for agreement and implementation of operational programs and its table of organization are diagramed. A tabular summary of the current ESRO satellite program is included. ESRO's future is viewed as representing a further challenge in international cooperation and yet another expression of European self-realization. The various ESRO facilities are discussed. S.Z.

A66-41777

A GENERALISED SYSTEM FOR PROJECT CONTROL AND EVALUATION.
George Mitchell.
Royal Aeronautical Society, Journal, vol. 70, Sept. 1966, p. 884, 885.

Description of the generalized system for project control and evaluating. This is an approach to avaluating quantitative indices of value and cost effectiveness that can be optimized, possibly by operational research methods, to produce information that can be used by management in making realistic decisions. The object of the system is to control and monitor a project from initiation, through development to completed production, considering the four essential variables of cost, time, performance, and reliability. The proposed management control system uses servomechanism control principles to construct an analog of the evaluation, development and production processes that are required for efficient management. It is constructed around four initial building bricks, consisting of management systems and models, resource allocation, time scheduling, performance evaluation, and reliability assessment. M. M.

A66-42094

OPERATIONAL EFFECTIVENESS AND MAINTAINABILITY VERIFICATION FOR SURVEILLANCE AND CONTROL SYSTEMS.
George H. Allen and Richard M. DeMilia (USAF, Systems Command, Electronic Systems Div., Technical Requirements and Standards Office, Hanscom Field, Mass.).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL NEW YORK CONFERENCE ON ELECTRONIC RELIABILITY, 7TH, NEW YORK, N.Y., MAY 20, 1966, CONFERENCE RECORD. [A66-42087 24-09]
Conference sponsored by the Professional Technical Groups on Reliability, Parts, Materials and Packaging; and the Basic Science Group of the Institute of Electrical and Electronics Engineers.
New York, Institute of Electrical and Electronics Engineers, 1966, p. 12-1 to 12-14. 9 refs.

Technical and management considerations involved in achieving operational effectiveness for a variety of surveillance and control systems are discussed. The quantification and verification of system/equipment maintainability features in terms of median-time-to-repair and ninetieth percentile are presented. Examples of maintainability requirements from current system/equipment programs are illustrated. **(Author)**

A66-42242 #

GIVING FORM TO OUR SPACE GOALS - RECENT LESSONS AND NEW DIRECTIONS (First Annual Robert H. Goddard Lecture).
Robert C. Seamans, Jr. (NASA, Washington, D.C.).
(National Space Club, Lecture, Washington, D.C., Spring 1966.)
Astronautics and Aeronautics, vol. 4, Oct. 1966, p. 60-66.

Review of the dual demands of space projects - increased detailed knowledge and better correlation of many disciplines. Project planning from the concept through detailed study and analysis to the design, building, and testing of experimental equipment is discussed. The roles of universities, industry, and government in implementing projects receive attention. F.R.L.

N66-10446# System Development Corp., Santa Monica, Calif.
AUTOMATED SYSTEM IMPLEMENTATION Preliminary Study Report
Michael R. Lackner and Patricia Kribs 10 Feb. 1964 11 p
(TM-1742(000)00; AD-431054)

Reports that the Automated System Implementation (ASI) Project which was designed to identify and initiate research activities necessary for the development of automated system implementation technology has completed a six-month period of study and exploration. States that the object of this research is to specify and develop techniques which can become coherent components of a highly automated scheme for implementing information processing systems, will be independently useful in developing information processing systems, and can be established as feasible within a two-year period. TAB

N66-10561*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
PROCEEDINGS OF NASA/INDUSTRY PERT COMPUTER CONFERENCE
[1964] 171 p Conf. held in Houston, 22-24 Jul. 1964
(NASA-TM-X-56870) CFSTI: HC $5.00/MF $1.00 CSCL 09B

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7. NASA PERT FORTRAN IV PROGRAM Elizabeth Ryan and Ross Bainbridge (NASA, Lewis Res. Center) 22 p

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9. THE NASA PERT 1410 SYSTEM Al Sheffield (NASA, John F. Kennedy Space Center) 4 p

10. USE OF THE SC-4020 FOR NASA PERT GRAPHIC OUTPUT (THE PAGE SYSTEM) Jerry Huffman (NASA, Marshall Space Flight Center) 10 p

11. PLANS FOR MECHANIZING CONTRACTOR FINANCIAL MANAGEMENT REPORT K. C. Mulcahy (NASA, Headquarters) 6 p

12. QUESTION AND ANSWER SESSION 10 p

N66-10633*# Massachusetts Inst., of Tech., Cambridge. Alfred P. Sloan School of Management.
RESEARCH PROGRAM ON THE ORGANIZATION AND MANAGEMENT OF RESEARCH AND DEVELOPMENT. QUESTIONING THE COST/EFFECTIVENESS OF THE R AND D PROCUREMENT PROCESS
Edward B. Roberts Sep. 1965 27 p refs Presented at the 2d Conf. on Res. Program Effectiveness, Office of Naval Res., Washington, 28 Jul. 1965.
(Grant NsG-235)
(NASA-CR-67766) CFSTI: HC $2.00/MF $0.50 CSCL 14A

Presented are results of a cost/effectiveness evaluation of the Research and Development procurement process which controls the awards of over $8 billion annually of government sponsored research and development contracts to industry, universities, and nonprofit organizations. Analyzed are data received via brief questionnaires which asked the following questions: (1) Who are the winners of research and development contracts? (2) What are the key determinants of the awards to these winners? (3) Compared with possible alternatives, what are the benefits of the present R&D procurement process? (4) Compared with possible alternatives, what are the costs of the present R&D process? S.C.W.

N66-10758*# Kansas Univ., Lawrence. Engineering Science Div.
PERFORMANCE OF HUMAN OPERATORS UNDER VARIOUS SYSTEM PARAMETERS
Hajime Akashi and Saad Mahmood Jun. 1965 37 p refs *Its* Studies in Eng. Mech. Rept.-22
(Grant NsG-298)
(NASA-CR-67625) CFSTI: HC $2.00/MF $0.50 CSCL 05H

The performance of human operators was investigated for varied system parameters. A practical performance index was defined, and the relation between the parameters and the performance index was found for a range of values of the parameters. Several operators with different control experience were tested, and it was found that human control capability can be represented by a hyperbolic curve in the parameter plane of gain and time constant. The result may be used in the design of man-machine systems that anticipate some unusually difficult situations which the operator may be required to deal with Author

N66-10809# Northwestern Technological Inst., Evanston, Ill.
DATA, MODELING AND DECISION
A. Charnes and W. W. Cooper Jun. 1965 12 p refs Prepared jointly with Carnegie Inst. of Tech. *Its* Systems Res. Memo-127
(Contracts Nonr-1228(10); Nonr-760(24))
(AD-620172)

Past experience with models—and related methods of analysis—may be an inadequate guide for managers considering a use of new tools now available. The latter, viewed as multiple-variable systems models, may differ in their data requirements and decision possibilities in comparison with predecessors that could handle only a few variables at a time. In approaching these new tools it is desirable to consider using the models as guides to data collection as well as decisions. This refers not only to data variety but also to data quality as judged by reference to the model itself. It may then be possible to eliminate needless expenditures of time and money on collecting or refining data. It is also desirable to consider integrating the modelling and decision making. Evaluations may then be secured which can guide alterations to the model and also open new decision possibilities which would otherwise not be apparent. The value of such a joint approach to data, models and decisions is examined and illustrated in the following article with special reference to media mix and new products marketing applications. Author (TAB)

N66-11046 Joint Publications Research Service, Washington, D. C.
CONCERNING THE OPTIMIZATION OF AN OPERATION SCHEDULE
Yu. V. Glebskiy *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser., Vol. 6, No. 5, 1963 10 Mar. 1964 p 223-253 refs (See N66-11026 02-25) CFSTI: $5.00

The problem is considered of planning the production of several types of parts on several machines, and for each part there is specified possible technological routes. It is required to set up a schedule, in which the maximum number of products is produced per unit time, for specified ratios between the numbers of parts of different types. In the idealization assumed here, the production product is infinite. It is shown that in order to find the maximum productivity of the equipment it is sufficient to solve the linear-programming problem, set up without account of the sequence of the operations involved in processing the parts. Author

N66-11165 Case Inst. of Tech., Cleveland, Ohio.
REPORT ON STUDY OF GENERALIZED, PROGRAMMED MANIPULATORS
Harry Mergler *In* AEC Proc. of the 1964 Seminars on Remotely Operated Spec. Equipment, Vol. 2 [1964] p 73-74 (See N66-11152 02-11) CFSTI: $1.25

The arm-aid control system has two disadvantages; the storage of incremental pulse data requires the use of an expensive memory system and the nature of the command data does not readily lend itself to automatic or computer generation. These two limitations serve as the primary starting-points for the study of generalized, programmed, remote manipulators. The design of multiple axes recorded information control systems and the logical design of computer hardware to implement information handling systems are discussed. E.E.B.

N66-11335# Pennsylvania Univ., Philadelphia.
INVENTORY CONTROL UNDER STOCHASTIC LEAD TIME AND STOCHASTIC DEMAND
Kenneth R. Rand, Jr. (M.B.A. Thesis) 1965 111 p refs
(AD-620921)

An attempt is made to investigate the behavior of an inventory system in which lead time, the size of the demand order, and the time between successive demand orders are all random variables with known probability distributions. Since adequate analytical mathematical models are not existent, a computer-based simulation model is used to study the inventory system. An introduction to the inventory problem and a description of inventory systems currently in use are provided. The formulation of the model is described. Results are presented as graphs of stockout time as a function of reorder point. TAB

N66-11547# System Development Corp., Santa Monica, Calif.
FACTORS THAT AFFECT THE COST OF COMPUTER PROGRAMMING
Leonard Farr and Burt Nanus Bedford, Mass., AFSC, Electron. Systems Div., Jul. 1964 63 p refs
(Contract AF 19(628)-1648)
(ESD TDR-64-448; AD-603707)

Although accurate estimation of computer programming costs is an important prerequisite for effective programming management, such estimates have historically been very unreliable. Some of the underlying causes of this problem are discussed, and about fifty factors that appear to contribute to the cost of computer programs are identified. Data concerning the effects of a few of these factors upon cost are presented by way of illustration. Recommendations are made for more detailed cost collection, cost analysis, and experimentation.
Author (TAB)

N66-12989*# Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.
PROBLEM SOLVING STRATEGIES IN PARALLEL RESEARCH AND DEVELOPMENT PROJECTS
Thomas J. Allen Jun. 1965 27 p refs *Its* Working Paper No. 126-65 Sponsored by NASA
(NASA-CR-68375) CFSTI: HC $2.00/MF $0.50 CSCL 05A

Three pairs of parallel R & D projects are examined. The data analyzed were gathered by means of Solution Development Records—a form which provides a weekly estimate of the probability of adoption of the approaches under consideration as possible solutions to a technical problem. It is found that the longer an approach is indicated by these forms to be in a favored position, the more difficult it is to reject. Furthermore, the number of alternative technical approaches considered bears a relation to judged solution quality. Groups producing higher-rated solutions generated fewer approaches during the course of the project, and they more closely approach an ideal strategy of approaches off on a two-at-a-time basis than do their poorer performing rivals.
Author

N66-14313# Research Analysis Corp., McLean, Va.
OPTIMAL DECISION RULES FOR THE E MODEL OF CHANCE-CONSTRAINED PROGRAMMING
Abraham Charnes (Northwestern Univ.), and Michael J. L. Kirby Jul. 1965 37 p refs
(Contracts DA-44-188-ARO-1; Nonr-1228(10))
(RAC-TP-166; AD-623094) CFSTI: HC $2.00/MF $0.50

The first five sections of this paper contain an introduction to the topic of chance-constrained programming. Then the general n-period expectation-objective model of chance-constrained programming is presented and certain necessary conditions are established for decision rules to be optimal for such a model. The question of the consistency of the constraints and the finiteness of the optimal value of the objective function for such problems is discussed and several methods of resolving these questions are presented. The simplification that results when the chance-constrained problem is treated as a problem of linear programming under uncertainty is also discussed. The paper is concluded by solving two two-stage problems.
Author (TAB)

N66-15402# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).
OPERATIONS RESEARCH V, TITLE INDEX
1964 55 p refs
(TDCK-40683) CFSTI: HC $3.00/MF $0.50

Titles of publications and reports announced in the abstract bulletin, *Operations Research*, are presented. The index is divided into sections on *Theory*, which include queuing, programming, game, information, and inventory theories, and the theory of the optimum distribution of effort; *Applications*, which covers management, military applications, quality control, accountancy, and medical problems; *Book Reviews*; and *News*.
M.G.J.

N66-15167# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
THE NONSUBSTITUTION AND NONSWITCHING THEOREMS IN A MODEL WITH FIXED CAPITAL
Eytan Sheshinski and Edwin Burmeister 20 Aug. 1965 28 p refs
(Contract Nonr-225(50)))
(TR-135; AD-622793) CFSTI: HC $2.00/MF $0.50

Let a competitive economy produce commodities of varying durabilities, such that (a) production processes exhibit constant returns to scale; (b) there is one exogenous nonproductible factor; (c) there are alternative techniques to produce each good; (d) it is possible to define conversion coefficients for old durable goods in terms of new goods of the same kind. Theorem: Let (A)-(d) hold. Then I: A long-run equilibrium of input-output coefficients and of prices in terms of wage units in uniquely determined for any preassigned value of the rate of interest. II: It is impossible to have identical techniques at different interest rates. This theorem generalizes Samuelson's static and dynamic nonsubstitution theorem.
Author (TAB)

N66-15196# Joint Publications Research Service, Washington, D. C.
MATHEMATICAL FORMULATION OF A SIMPLIFIED MODEL OF PRODUCTION PLANNING
Yu. N. Tyurin 6 Jan. 1966 36 p refs Transl. into ENGLISH from Ekon. i Mat. Metody (Moscow), v. 1, no. 3, May/Jun. 1965 p 391-409
(JPRS-33613; TT-65-30057) CFSTI: $2.00

A production model is considered in which consumption during the planning period is given, and a production plan to satisfy this consumption is selected. A system of objectively conditioned evaluations of commodities and production capacities was studied. Commodity is the term used to describe everything produced by the economic system, and the amounts of commodities are measured in continuously changing quantities. Each individual enterprise or economic unit is described by its economic possibilities; that is, at identical expenditures of labor, power, raw materials, semi-finished products, etc., the same enterprise has the possibility of manufacturing different finished products. Each enterprise is put into relationship with a production map. The mathematical details and the concept of a differentiable map are given, and the conditions for the differentiability are formulated. The overall production possibilities of the entire economy are also described for a time period by the production map. The criteria of optimality are considered for the aims of the economy, and formulas are derived to define management by means of evaluation, and the income and outlay structure.
M.G.J.

N66-15348*# Northrop Space Labs., Hawthorne, Calif.
TECHNOLOGY UTILIZATION WORKSHOP SUBJECTS STUDY, SUPPLEMENT 1
D. E. Kaufman and W. E. Brooner Jun. 1964 20 p
(Contract NAS7-277)
(NASA-CR-69288; NSL-64-125-1) CFSTI: HC $1.00/MF $0.50 CSCL 05A

The Technology Utilization Program was analyzed and evaluated in terms of organization, composition and participation, and actual extent of information dissemination. Problems elucidated at the plenary meeting concerned definitions of specific industry needs, modifications to government procurement and administrative procedures, motivation for extended commercial research, and methods for identifying new technology. Technological areas of discussion included space electrical power systems, metal forming, materials and structures, valves and pumps, biomedical research, electronics and optics, and management concepts. Conclusions and recommendations covered the need for a bold confident approach, for better advertising, for more diversified industry participation and increased time for question and answer periods, and for pre-editing of presented material.
D.T.

N66-15729*# Honeywell, Inc., St. Petersburg, Fla. Military Products Group

NASA PATTERN RELEVANCE GUIDE. VOLUME I: GENERAL, SPACE SCIENCE AND UTILIZATION

Richard H. Parvin. 1 Dec. 1965. 287 p. refs. Revised (Contract NAS8-20207)

(NASA-CR-69536; MH-AERO-820207-HG) CFSTI: HC $5.00/MF $1.50 CSCL 22A

Information for use in assigning relevance to elements on the PATTERN relevance tree is summarized. The PATTERN (planning assistance through technical evaluation of relevance numbers) is described as a management planning aid used to determine the relevance of space programs or concepts for accomplishing specific tasks, and hence the technology deficiencies involved in each program. Material relevant to voting the first four levels of the PATTERN tree is discussed, including (1) the United States and Soviet goals and capabilities in space; (2) the scientific exploration of space and the use of space for practical purposes; (3) the summary reasons for interest in each target of space exploration and utilization; (4) the scientific disciplines involved and how they will benefit from space flight, and (5) the principal tasks or scientific interests in each discipline. Astronomical reference tables, and lists of space sciences tasks are also included. M.G.J.

N66-15779# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).

REVIEW OF LITERATURE ON OPERATIONS RESEARCH

24 Sep. 1965. 34 p. refs. In DUTCH, ENGLISH, FRENCH, and GERMAN *Its* Vol. 9, No. OR-74 CFSTI: HC $2.00/MF $0.50

Presented is a compilation of report literature on developments in operations research, linear programming, game theory, information theory, management, economics of system analysis, war gaming as a technique in the study of operational research problems, cost-effectiveness for military systems analysis, mathematical statistics, and reliability of electronic parts. A program, initiated by the NATO Science Committee, of graduate apprenticeships in operational research is described. M.R.W.

N66-15783# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).

REVIEW OF LITERATURE ON THE INDUSTRIAL SCIENCES [BEDRIJFSWETENSCHAPPEN LITERATUUROVERZICHT]

13 Sep. 1965. 29 p. refs. In DUTCH and ENGLISH *Its* Vol. 4, No. EM-86

CFSTI: HC $2.00/MF $0.50

An annotated bibliography on management systems, financial control, economizing, cost estimation, logistics, psychology, sociology and personnel training techniques in military, industrial, and research facilities is presented. M.R.W.

N66-16001# Army Missile Command, Huntsville, Ala. Management Science and Data Systems Office.

THE IMPACT OF ADP ON THE FUTURE MANAGERIAL ENVIRONMENT

Bruce L. Garrett. 15 Jun. 1965. 82 p. refs

(RSIC-438; AD-472768)

A synthesis of predicted Automatic Data Processing (ADP) developments in terms of their relationships to the total management of an organization, directed primarily to managers faced with a growing demand for better ADP utilization. ADP equipment capabilities likely to be available during the next decade are outlined in detail. Current techniques for the use of ADP systems and problems involved in installing improved future applications are discussed. A timetable is shown predicting the general acceptance and use of applications leading to maximum economical computer utilization. The ADP displaced worker situation is portrayed and actions for its alleviation are suggested. Statistics covering situations where ADP actually displaced workers are shown in graphic form. Managerial approaches to coping with systems integration, personnel training, and organizational structure evolving from an ADP influenced society are presented. Author (TAB)

N66-16843 California Univ., Berkeley. Lawrence Radiation Lab.

COST ESTIMATING MAGNET SYSTEMS WITH THE AID OF A COMPUTER

H. Paul Hernandez, Raymond W. Schwarz, and R. B. Yourd *In* Stanford Univ. Proc. of the Intern. Symp. on Magnet Technol. 1965 p 196-207 ref. (See N66-16826 07-23) CFSTI: $8.50

Computer programs were found to be effective aids in parameter optimization and preliminary cost estimations for magnet systems. The COMA Fortran program, which can be used to compute 12 basic magnet geometries, was used with an EFFIC subroutine on a 6-meter spherical bubble chamber magnet. Magnetic fields up to 70 kG were studied, and optimum coil dimensions and core thicknesses were found. At 50 kG, total cost for an operating time of 20 000 hr was found to be $32 000 000. An MAGHYP program was used in the parameter selection and cost estimate for an 8-BeV injector synchrotron gradient magnet system. Cost optimization studies indicated that parameter selections can be made more accurately than future market requirements can be predicted. Other magnet design cost applications are possible with these computer programs. M.W.R.

N66-16851 Westinghouse Electric Corp., Sunnyvale, Calif.

RELIABILITY AND QUALITY CONTROL

L. D. Connell *In* Stanford Univ. Proc. of the Intern. Symp. on Magnet Technol. 1965 p 281-286 refs (See N66-16826 07-23) CFSTI: $8.50

An integrated approach must be followed to obtain reliability and quality control as well as to reduce economic waste throughout all phases of the manufacturing process. Causes of unreliability and the basic problems are considered. Reliability is discussed in terms of relationships, disciplines, and goals; the need for inherent reliability in design procedures is emphasized; and a design review reliability check list is presented. Product verification, quality of manufactured products, procurement, and defect analysis are reviewed. Both analytical and control techniques are considered necessary to achieve reliability in the manufacture of heavy electrical equipment. M.W.R.

N66-17074*# Stanford Univ., Calif. Dept. of Statistics.

R CHART CONTROL LIMITS BASED ON A SMALL NUMBER OF SUBGROUPS

Frederick S. Hillier. 4 Oct. 1965. 24 p. refs. *Its* Tech. Rept.-83 Sponsored by NASA

(Contract Nonr-225(53))

(NASA-CR-70310) CFSTI: HC $1.00/MF $0.50 CSCL 12A

A previously proposed method for setting statistically sound $\bar{X}$ chart control limits is adapted to the R chart. This chart for the range R being a valuable tool for controlling the variability of a production process. After evaluating the reliability of the conventional R chart control limits, a new method is presented for setting these limits so that they can be used reliably regardless of how few subgroups have been inspected. C.T.C.

N66-17287# Virginia Univ., Charlottesville. Dept. of Economics.

ON TWO COMMODITY NETWORK FLOWS

B. Rothschild and A. Whinston. Oct. 1965. 24 p. refs

(Contract Nonr-4811(00))

(ONR-2; AD-624500) CFSTI: HC $1.00/MF $0.50

The paper considers the problem of two-commodity network flows and generalizes a result of Hu on integral flows in networks with integral capacities. The main result of the paper is a Max-flow Min-cut theorem for two commodity networks. The method of proof involves a particular type of separation process. This leads to an algorithm for finding the maximal flows. Several counterexamples to certain possible generalizations are given at the end of the paper. Author (TAB)

N66-17366# Joint Publications Research Service, Washington, D. C.

CYBERNETICS (NO. 4, 1965)

17 Dec 1965 276 p refs Transl. into ENGLISH from Kibernetika (Kiev), no. 4, Jul.-Aug. 1965 p 1-1025 (JPRS-33371; TT-65-33946) CFSTI: $6.00

CONTENTS:

1. ALGEBRAIC FEATURES OF THE COMPUTATIONAL POWER OF AN AUTOMATON M. A. Spivak p 1-28 refs (See N66-17367 08-10)

2. SOME PROBLEMS OF LANGUAGE THEORY V. N. Red'ko p 29-51 refs (See N66-17368 08-08)

3. A METRIC SPACE OF EVENTS. II. V. G. Bodnarchuk p 52-72 refs (See N66-17369 08-19)

4. EVALUATION OF THE COMPLEXITY OF CUTTING ALGORITHMS S. V. Makarov p 73-90 refs (See N66-17370 08-08)

5. METHODS FOR MINIMIZING FUNCTIONS OF MANY-VALUED LOGIC A. M. Romankevich p 91-102 refs (See N66-17371 08-19)

6. CHECKING ARITHMETIC OPERATIONS IN A CODE OF DEDUCTIONS G. K. Kladov, Ye. M. Lyakhovitskiy, and A. Ya. Shpil'berg p 103-108 refs (See N66-17372 08-19)

7. ALGORITHMS, PROGRAMMING LANGUAGES, AND DISPOSITIONS V. B. Borshchev and Yu. A. Shreyder p 109-130 refs (See N66-17373 08-08)

8. EQUIVALENT TRANSFORMATIONS OF SINGLE-ADDRESS COMPLEXES V. N. Porshneva p 131-144 refs (See N66-17374 08-08)

9. SOME PROPERTIES OF AN INDEPENDENT-INCREMENT PROCESS CONNECTED WITH THE DISTRIBUTION OF ITS MAXIMUM E. S. Shtatland p 145-151 refs (See N66-17375 08-19)

10. DUAL METHOD IN EXTREMUM PROBLEMS. II. B. N. Pshenichnyy p 152-165 (See N66-17376 08-19)

11. THE PROBLEM OF THE OPTIMAL DISTRIBUTION OF CIRCULAR PATTERNS V. L. Rvachev and Yu. G. Stoyan p 166-178 refs (See N66-17377 08-19)

12. A CLASS OF STANDARD OPERATORS FOR ECONOMIC PROBLEM ORIENTED COMPUTER SYSTEMS. I. V. N. Afanas'yev, A. S. Lozinskiy, and S. B. Pogrebinskiy p 179-197 (See N66-17378 08-08)

13. MEMORY ORGANIZATION FOR SEARCHING AND RECORDING ON KEYS V. P. Gladun p 198-218 refs (See N66-17379 08-08)

14. A METHOD FOR SYMBOLIC PROGRAMMING G. P. Bagrinovskaya p 219-238 refs (See N66-17380 08-08)

15. AN APPROACH TO SOLUTION OF THE TRANSPORT PROBLEM WITH RESTRICTIONS V. V. Shkurba p 239-242 refs (See N66-17381 08-19)

16. ON REPRESENTATION OF A SUM MODULO mod m IN A CLASS OF NORMAL FORMS OF FUNCTIONS OF m-VALUED LOGIC N. N. Ayzenberg p 243-244 ref (See N66-17382 08-19)

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18. THE THIRD ALL-UNION CONFERENCE ON INVARIANCE THEORY AND ITS APPLICATION IN AUTOMATIC CONTROL SYSTEMS p 247-248

19. INFORMATION ON THE AUTHORS p 249-251

20. INSTRUCTIONS FOR AUTHORS p 252-255

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N66-17368 Joint Publications Research Service, Washington, D. C.

SOME PROBLEMS OF LANGUAGE THEORY

Vladimir Nikiforovich Red'ko *In its* Cybernetics (No. 4, 1965) 17 Dec. 1965 p 29-51 refs (See N66-17366 08-08) CFSTI: $6.00

Grammars are presented which would take into consideration, as much as possible, the specifics of problems encountered in automating the synthesis of computers and in automating programming, and which are sufficiently transparent for theoretical studies and application to various fields of mathematics. Two fundamentally different methods for formal representation of new languages from given languages are discussed. The first method is that of formulating anew by means of recursion operations; the second method is that of implicit formulation of languages with the aid of a system of equations in languages of which they are solutions. All languages which are solutions of this system are represented in a simple manner by recursion operations. E.E.B.

N66-17378 Joint Publications Research Service, Washington, D. C.

A CLASS OF STANDARD OPERATORS FOR ECONOMIC PROBLEM ORIENTED COMPUTER SYSTEMS, I

Vyacheslav Nikolayevich Afanas'yev, Leonid Solomonovich Lozinskiy, and Solomon Beniaminovich Pogrebinskiy *In its* Cybernetics (No. 4, 1965) 17 Dec. 1965 p 179-197 (See N66-17366 08-08) CFSTI: $6.00

The separation of a convenient set from a single class of standard data processing operators for a certain class of economic problems is examined. Accounting and problems connected with administration and scheduling in industrial enterprises are considered. The basic parameters of file handling operators which permit the analysis and description of these operators are discussed, and the file handling operators which are expediently used as standard operators in planning are examined. E.E.B.

N66-17591# David Taylor Model Basin, Washington, D. C. Applied Mathematics Lab.

MODERN MISER: A CRITICAL PATH AND RESOURCE ALLOCATION METHOD FOR THE UNIVAC LARC

Abel William Camara and Natalie Tarter Goldberg May 1964 142 p refs

(DTMB-1796; AD-602827) CFSTI: HC $5.00/MF $1.00

The MODERN MiSER System is a planning and scheduling tool developed on the Remington-Rand UNIVAC LARC Computer. It is designed to assist management in comprehending the logical restrictions on a series of activities pertaining to one or many projects. The system includes a basic critical path method, a cost optimization routine, a float allocation procedure, the facility for manpower leveling, and the resource planning and scheduling method. Various algorithms used in the development of the system are discussed. The machine procedure used to adapt these formulas to the LARC are shown. Author (TAB)

N66-17692# Army Research Office, Durham, N. C.
PROCEEDINGS OF THE ARO WORKING GROUP ON COMPUTERS
Feb. 1965 299 p refs Meeting held at Washington, 5-7 Jan. 1964
(AROD-65-1; AD-613592) CFSTI: HC $7.00/MF $2.00

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2. ALGEBRAIC OPERATIONS WITH POWER SERIES ON A DIGITAL COMPUTER G. T. Mc Allister and J. V. Lanahan (Aberdeen Proving Ground) p 9-16 (See N66-17693 08-08)

3. MINIMAL SPHERE COVERING C. Masaitis (Aberdeen Proving Ground) p 17-43 refs (See N66-17694 08-19)

4. ON MATCHING PROBLEMS J. Edmonds, A. J. Goldman, C. Witzgall, C. T. Zahn, Jr. (Natl. Bur. of Standards) p 45-50 refs (See N66-17695 08-19)

5. USE OF COMPUTER MADE DECISIONS IN QUALITY EVALUATION Robert I. Mc Keague, Jr. (Army Ammunition Procurement and Supply Agency) p 51-54

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7. REAL-TIME OPERATIONS AT WHITE SANDS MISSILE RANGE B. E. Billups (White Sands Missile Range) p 85-111 refs (See N66-17697 08-08)

8. A POLISH-TYPE NOTATION FOR CHEMICAL STRUCTURES Sylvan H. Eisman (Frankford Arsenal, Philadelphia) p 113-128 refs

9. YOU CAN ALWAYS TELL A COMPUTER BUT YOU CAN'T TELL IT MUCH J. H. Wegstein (Natl. Bureau of Standards) p 129-151 (See N66-17698 08-08)

10. A DYNAMIC PROGRAMMING SOLUTION FOR A COMBINATORIAL PROBLEM INVOLVING THE SELECTION OF A SET OF OPTIMUM WEAPON YIELDS W. Sacco (Aberdeen Proving Ground) p 153-164 refs (See N66-17699 08-08)

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12. WORK IN PROGRESS AT THE MATHEMATICS RESEARCH CENTER ON THE NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATIONS D. Greenspan, P. C Jain, R. Manohar, B. Noble, and A. Sakurai (Wis. Univ.) p 213-260 refs (See N66-17700 08-12)

13. NUMERICAL EVALUATION OF INTEGRALS AND SOLUTIONS OF INTEGRAL EQUATIONS L. B. Rall (Wis. Univ.) p 261-265 refs (See N66-17701 08-19)

14. HYBRID COMPUTER SYSTEMS AND THEIR APPLICATIONS H. K. Skramstad (Naval Ordnance Lab.) p 277-331 (See N66-17702 08-08)

15. LIST PROCESSING AT RAC R. S. Smith (Res. Analysis Corp.) p 333-347 refs (See N66-17703 08-08)

16. LEARNING A SIMULATION LANGUAGE A. E. Weinert (Res. Analysis Corp.) p 349-365 ref (See N66-17704 08-08)

17. INFORMATION RETRIEVAL—A NEW TECHNOLOGY? C. E. Walston (IBM) p 367-373 refs (See N66-17705 08-08)

N66-17706*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SYMPOSIUM ON TECHNOLOGY STATUS AND TRENDS
Washington, NASA, 1966 239 p refs Symp. held at Huntsville, Ala., 21-23 Apr. 1965
(NASA-SP-5030) GPO: HC $1.50; CFSTI: MF $1.25 CSCL 13

Report concerns progress and advances associated with aerospace technology which may contain major potential for industrial applications. For individual titles see N66-17707-N66-17732.

N66-17698 National Bureau of Standards, Washington, D. C.
YOU CAN ALWAYS TELL A COMPUTER BUT YOU CAN'T TELL IT MUCH
J. H. Wegstein *In* AROD Proc. of ARO Working Group on Computers Feb. 1965 p 129-151 (See N66-17692 08-08) CFSTI: HC $7.00/MF $2.00

Past successes with computer programming are reviewed, and areas of neglect are identified. These include computer processing of information that comes directly from instruments; computer application to command and control problems; the communication barrier between man and computer; the remote station and visual display; and the ability of the specialist to speak with the computer in his own language, whether it be military logistics, chemical formulas, or vector algebra. The danger of locking-on to some language idea and looking for problems where it can be applied is pointed out, and an approach is recommended whereby many different problems are examined to ascertain what they have in common and how they can be described. Research underway on various facets of computer programming are discussed. These include the problem of searching a chemical file; studies of hereditary diseases in small populations of primitive people; an assembly process in which parts are assembled on a reusable locating jig; a graph-theoretic notation; and the subroutines and programs needed for manipulating cyphers. M.G.J.

N66-17705 International Business Machines Corp., Bethesda, Md.
INFORMATION RETRIEVAL—A NEW TECHNOLOGY?
C. E. Walston *In* AROD Proc. of ARO Working Group on Computers Feb. 1965 p 367-373 refs (See N66-17692 08-08) CFSTI: HC $7.00/MF $2.00

Activities in the information retrieval field are surveyed, problems are examined; accomplishments are noted; and the tasks remaining to be undertaken are identified. The functions of an information retrieval system are defined as indexing and storage, and querying and retrieval. Techniques for automatic indexing are discussed, along with a procedure for machine-generated abstracts. These include automatic selection of keywords, the calculation of coefficients of association among index terms, and the automatic classification of documents into one or more categories through use of a discrimination method. It is recommended that an intensive effort be made to correlate empirical knowledge and the results of theoretical work into a unified theory of information storage and retrieval. M.G.J.

N66-18335*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.
AUTOMATIC FLOW CHART DESIGN
G. Hain (Dynaelectron Corp.) and Klaus Hain [1965] 21 p Presented at the 20th Natl. Conf. of the Assoc. for Computing Machinery, Cleveland, 24-26 Aug. 1965 Submitted for Publication
(NASA-TM-X-56174) CFSTI: HC $1.00/MF $0.50 CSCL 09B

There is an increasing demand for good documentation of complex programs; in particular, the design of flow charts takes a lot of time and is a strain on the programmer. For these reasons, flow charts are often neglected. This paper describes a program written in Fortran that does the tiresome work of drawing the flow chart of a program. The actual drawing is done with the aid of a SC 4020 and can easily be changed for any other plotter device. Such a flow chart gives the logical structure of a program, e g., it shows the connections between the different parts of a program and its branches. This program not only can be used in the documentation of programs, but also to find logical errors and also to "clean up" (reorganize) a program which is in the stages of development. The same program can be used to draw PERT networks. Author

N66-18352*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

LANGLEY MANAGEMENT OF A NASA RELIABILITY AND QUALITY ASSURANCE PROGRAM

S. P. Leonardy [1965] 20 p Presented at the 14th Ann. Quality Control Clinic of the Am. Soc. for Quality Control, Minneapolis, 2 Feb. 1965

(NASA-TM-X-56200) CFSTI: HC $1.00/MF $0.50 CSCL 05A

Procedures by which contractors are expected to eliminate incipient failures during design, manufacturing and assembly, and testing are described in detail. Quality program planning is discussed, and it is pointed out that requirements must be satisified throughout all phases of preliminary engineering, engineering design, development, fabrication, processing, assembly, inspection, testing, checkout, packaging, shipping, storage, maintenance, field use, flight preparation, flight operations, and flight analysis. The value of failure mode, effect, and criticality analyses, and of continuing design review is stressed. The importance of supplying documented criteria, as outlined in the NASA publications, is emphasized, and the work of the Material Review Board, established for the control and disposition of nonconforming material, is discussed. The relationship between contractor and subcontractor is delineated, and the need for communications between NASA and the contractor is recognized. The programs are identified as development, functional, qualification, and flight acceptance; each is defined. A documentation schedule is also included as an example. M.G.J.

N66-19046# Joint Publications Research Service, Washington, D. C.

PROBLEMS IN THEORETICAL CYBERNETICS

V. M. Glushkov, ed. 3 Feb. 1966 219 p refs Transl. into ENGLISH of the book "Voprosy Teoreticheskoy Kibernetiki" Kiev, Naukova Dumka, 1965 p 1-211

(JPRS-33991; TT-66-30434) CFSTI: $6.00

Problems related to the abstract theory of automata, graph theory and its applications in the automation of design of digital automata, program automation and algorithmic languages, new algorithmic structures of mathematical machines, planning of design operations and methods for analytical description of complex geometric objects are investigated. For individual titles see N66-19047-N66-19068.

N66-19066 Joint Publications Research Service, Washington, D. C.

ON THE PROBLEM OF PLANNING DESIGN WORK

T. A. Grinchenko and V. V. Shkurba *In its* Probl. in Theoret. Cybernetics 3 Feb. 1966 p 169-177 refs (See N66-19046 09-08) CFSTI: $6.00

This paper discusses the problems involved in organizing a design operation with respect to a calendar plan. The difficulty of such a task lies in the time consuming construction of graphs, even with the aid of high speed computers. However, digital computers can play a significant role in improving the organization for executing a design project. Computers can expand the set of rules and evaluations on the basis of which the design work is planned, they can select the most reasonable plan on the basis of investigations of a large set of variations, and they can do the planning objectively which also plays an important role in controlling the human collective. R.N.A.

N66-19206# Bureau of Naval Weapons, Washington, D. C.

HANDBOOK: RELIABILITY ENGINEERING

1 Jun. 1964 379 p refs

(NAVWEPS-00-65-502) GPO $2.75

This handbook provides step by step procedures for the definition, pursuit, and acquisition of required reliability and maintainability in naval weapons systems, equipment, and components. The methods presented are generally applicable to all categories of weapons system elements—electronic, electro-mechanical, mechanical, hydraulic, chemical, etc. It gives general guidance for the implementation of selected reliability program functions, as well as procedures and technical detail sufficient for design guidance in the actual achievement of required programs. The handbook attempts to satisfy the need for a digest of these principles through practical examples drawn from the several phases of a typical system life cycle. Charts and diagrams illustrate the text. H.S.W.

N66-19224# System Development Corp., Santa Monica, Calif.

RESEARCH AND TECHNOLOGY DIVISION REPORT FOR 1964

C. Baum, ed. Jan. 1965 168 p refs

(TM-530/008/00)

The objectives of the integrated research and technology division are defined, and the areas in which their activities are centered are identified. Summarized are reports on information processing research, programming systems, programming technology, language processing and retrieval, mathematics research, decision processes research, and education and training. Included is a brief description of a technique for testing the feasibility of concepts that emerge from a research effort and for providing simulation tools in empirical investigations of analytic modeling techniques of military command systems. The feasibility of using computers in assisting military decision makers is discussed, and analogies are drawn for using these systems in other applications. H.S.W.

N66-19705*# Missouri Univ., Kansas City.

[A STUDY OOF THE LOCATION OF SCIENTIFIC RESEARCH AS AN ECONOMIC PHENOMENON] Second Semiannual Progress Report, Aug. 1, 1965-Jan. 31, 1966

[1966] 22 p refs

(Grant NGR-26-004-012)

(NASA-CR-71034) CFSTI: HC $1.00/MF $0.50 CSCL 14A

Progress is reported in the study of cost structures in research facilities to establish cost or efficiency criteria for the spatial allocation of funds for scientific research. Specifically, attempts were made to analyze the effects of clustering or agglomeration on the cost of performing certain kinds of research activities. This involves an improvement in the theory of agglomeration, extending the theory to include research, and the empirical documentation of variations produced in costs by the presence of other economic or research activity in the same local area. The following studies are described: (1) Location Patterns of Research Activities; (2) Bibliographic Source Materials Collection; (3) Decentralized Decision Making and Agglomeration Equilibriums in Research; (4) Economies of Scale in Research Agglomerations; (5) Agglomeration Economies and the Location of Industrial Research; and (6) A Theory of Production and Location for the Research Firm. R.R.D.

N66-20239# General Electric Co., Schenectady, N. Y. Knolls Atomic Power Lab.

THE DATAPOOL CONCEPT. A DATAPOOL SIMULATION SUBROUTINE

J. A. Warrington and E. E. Kazmierczak 22 Mar. 1965 17 p Presented at the Transac Users Group Meeting, San Antonio, Tex.

(Contract W-31-109-ENG-52)

(CONF-650408-1) CFSTI: HC $1.00/MF $0.50

The design of a file management scheme for computer tapes is described. The scheme (called DATAPOOL) is in use at KAPL. The DATAPOOL concept is described, and a program that implements the DATAPOOL concept is shown. NSA

N66-23896# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

DOD PROGRAMMING SYSTEM. AN EXPLANATION AND EVALUATION

Stewart De Witt Hawkins, Paul Richard Miller, and Paul Archibald Cameron, Jr. (M.S. Thesis) Aug. 1965 164 p refs (GSM/SM/65-5; AD-628101) CFSTI: HC $16.00/MF $1.00

The DoD Programming System was introduced in 1961–62 by Secretary McNamara to integrate the planning-programming-budgeting phases of defense decision making. This report is an explanation of how the system operates and an evaluation of it, using as a standard basic management principles. This system provides for planning and programming to be conducted on a mission oriented basis and for the overall review of the services programs. It is a more effective method of defense management than was previously used. Current problems with the DoD Programming System however have caused OSD to be pre-occupied with detailed management of short- and mid-range goals to the detriment of long-range planning and general policy guidance. Author (TAB)

N66-24519# Joint Publications Research Service, Washington, D. C.

CERTAIN PROBLEMS IN THE MATHEMATICAL DESCRIPTION OF INTERCONNECTED PRODUCTION PROCESSES

N. S. Raybman *In its* Autom. Operational Management of Processes of Production 8 Apr. 1966 p 46–72 refs (See N66-24515 13-10) CFSTI: $7.00

Methods of determining the dynamic characteristics of mathematical models are discussed, for a unidimensional process, and for a productive object with unidimensional processes. Schematics of both processes are included, the numerical characteristics of each are examined, and equations are derived. The dispersion function of a random function, and the reciprocal dispersion function of two random functions are considered, and it is pointed out that the characteristics of these functions should be used in determining the degree of connection between the variables, independently of the form of connection between them. Linear and nonlinear cases are examined. Based on a comparison of the estimated values of the correlation and dispersion functions, it was concluded that the degree of nonlinearity can be determined on the basis of the F-criterion. M.G.J.

N66-24524# Joint Publications Research Service, Washington, D. C.

AN INSTRUCTION CODE FOR A CONTROLLING COMPUTER

E. A. Trakhtengerts and V. E. Yurchenko *In its* Autom. Operational Management of Processes of Production 8 Apr. 1966 p 120–135 refs (See N66-24515 13-10) CFSTI: $7.00

Explanatory details are given on a proposed instruction code which describes the monitoring and control process. As conditional or unconditional transfer of control is provided in the instructions, the addresses of the transfer of control are also recorded in the appropriate cells. The fixed addresses are listed, along with the designations introduced in the instructions. Five fixed instructions are also listed for describing the algorithm of monitoring and control of production. The most typical algorithms for continuous production are discussed, and block diagrams are included to amplify the text. M.G.J.

N66-26316# Joint Publications Research Service, Washington, D. C.

STUDIES IN MAN-MACHINE RELATIONSHIPS

A. N. Rayevskiy et al 9 May 1966 21 p Transl. into ENGLISH from selected Russian periodicals

(JPRS-35410; TT-66-31846) CFSTI: $1.00

CONTENTS:

1. MAN AND MACHINE A. N. Rayevskiy and A. V. Antonov p 1–7
2. COMPUTER USE SHOULD BE EXPANDED F. Goranskiy p 8–14

N66-24528# Joint Publications Research Service, Washington, D. C.

THE CRITERIA OF OPTIMAL CONTROL OF A COMPLEX PRODUCTION SYSTEM AND OF ITS INDIVIDUAL COMPONENTS

V. M. Dobkin *In its* Autom. Operational Management of Processes of Production 8 Apr. 1966 p 214–226 refs (See N66-24515 13-10) CFSTI: $7.00

The factors characterizing the quality of production control are reviewed, in relation to establishing criteria of optimality. Factors determining the selection of the optimum conditions of production are defined as: (1) the relative economic nature of a given production facility in comparison with that of other production facilities turning out the same product; and (2) the deficit status of production, or the relation between the requirement of the national economy for a given product and the productivity of the effective capacities. The influence of these factors is evaluated, and the conditions of optimum control of a group of parallel components are analyzed. Control algorithms are developed, and a system of two consecutive processes is presented for optimizing the group of consecutive components. M.G.J.

N66-24652# Congress. House. Committee on Science and Astronautics

NASA AUTHORIZATION FOR 1967, PART 1, NO. 4

Washington, GPO, 1966 381 p Hearings Before Comm. on Sci. and Astronautics, 89th Congr., 2d Sess. on H.R. 12718 (Superseded by H.R. 14324), 10, 11, and 22 Mar. 1966

The broad context of the total NASA program, its accomplishments, its present status, and the implications for the future are discussed in relation to the presidential recommendations for authorization of funds. Management policies, planned activities, and schedules for accomplishing specific objectives are detailed for the Offices of Advanced Research and Technology, Tracking and Data Acquisition, Manned Space Flight, and Space Science and Applications. Research and development requirements are identified, and the operational capabilities and contributions of each NASA center are discussed. Funding requirements for the various programs are explained. Minor construction involving new and existing structures, and alteration projects funded from the administrative operations appropriation are listed. An analysis of data processing equipment in use at the NASA installations is also included. M.G.J.

N66-25672# Martin Co., Orlando, Fla.

MAINTAINABILITY ENGINEERING

John Geise (Pittsburgh Univ.) and Walker W. Holler (Duke Univ.) 1965 275 p refs Prepared in cooperation with Duke Univ.

(Contract DA-31-124-ARO-(D)-100-34)

(AD-630131) CFSTI: HC $6.00/MF $1.50

This text has been developed to satisfy several objectives. The first objective is to satisfy the requirement for a textbook, to be used in university curricula, that will acquaint future engineers with the requirements for maintainability in the products they may eventually design. The second objective is to provide a standard textbook for use by practicing engineers who may wish, through self-study, to expand the boundaries of their professional thinking. The third of these is to provide a standard reference work for use by: Contracting personnel, who must specify and define the product requirements. Design engineers, who must choose the parts and integrate them into operational systems that meet product requirements. Maintainability engineers, who must assure their companies and the customers that the products represent not only the optimum for satisfying the demands of the market, but also that they will survive in their environment. TAB

N66-25870# System Development Corp., Santa Monica, Calif

HUMAN ENGINEERING THE GPDS/LUCID SYSTEM: CONSIDERATIONS AND PLANS

Charles W Simon 30 Nov 1965 30 p refs

(Contract AF 19(628)-5166)

(SDC-TM-2776; AD-628206) CFSTI: HC $2.00/MF $0.50

Human engineering considerations and plans for the study and evaluation of the GPDS/LUCID system are discussed. Specific project goals are: (1) to determine how well the current systems match users' needs and (2) to make recommendations for improving the system where these needs are not met. An ultimate project goal will be to determine human engineering design principles useful for the development of user-oriented, on-line information processing systems in general. Project investigation will examine the GPDS/LUCID systems from the point of view of a user who is essentially unsophisticated in computer programming. Author (TAB)

N66-25948# RCA Service Co., Inc:, Alexandria, Va.

CRITERIA FOR VALUE ENGINEERING. PHASE I: FEASIBILITY STUDY Interim Report, Jul.–Nov. 1965

R. E. Purvis and R. L. Mc Laughlin Griffiss AFB, N. Y., RADC, Feb. 1966 48 p refs

(Contract AF 30(602)-3850)

(RADC-TR-65-475; AD-630207) CFSTI: HC $2.00/MF $0.50

The state of the art of value engineering is summarized and a value analysis technique is proposed with the following characteristics: (a) Quantification of value consistent with established USAF specification of system utilization. (b) Value parameters which are predictable and measurable; (c) Systematic method of quantitative analysis which permit practical optimization in the least cost sense consistent with system value. (d) Technique structure which permits design tradeoff of discrete alternatives relating to cost and system value parameters. (e) Method of cost analysis which permits optimization with respect to total cost and is consistent with both design and operational value parameters. (f) Method of cost analysis based on difference principles which permits decisions through dominance of one alternative to another. (g) General method of analysis which permits cost in time and singling out areas significant cost differences between alternatives. TAB

N66-26296# Applied Data Research, Inc., Princeton, N. J.

COMMUNICATION WITH AUTOMATA, VOLUME I, SUPPLEMENT I Final Report

Carl Adam Petri Griffiss AFB, N. Y., RADC, Jan. 1966 98 p refs Prepared in cooperation with Computer Assoc. Inc., Wakefield, Mass. Transl. into ENGLISH of Kommunikation mit Authomaten (Bonn), 1962

(Contract AF 30(602)-3324)

(RADC-TR-65-377; AD-630125)

The theory of automata is shown not capable of representing the actual physical flow of information in the solution of a recursive problem. The argument proceeds as follows: (1) The following postulates are assumed: (a) there exists an upper bound on the speed of signals; (b) there exists an upper bound on the density with which information can be stored. (2) Automata of fixed, finite size can recognize, at best, only iteratively defined classes of input sequences. (3) Recursively defined classes of input sequences that cannot be defined iteratively can be recognized only by automata of unbounded size. (4) In order for an automaton to solve a (soluble) recursive problem, the possibility must be granted that it can be extended unboundedly in whatever way might be required. (5) Automata (as actual hardware) formulated in accordance with automata theory will, after a finite number of extensions, conflict with at least one of the postulates. Suitable conceptual structures for an exact theory of communication are then discussed, and a theory of communication proposed. TAB

N66-26780# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).

REVIEW OF LITERATURE ON INDUSTRIAL SCIENCE [LITERATUUROVERZICHT DEDRIJFS WETENSCHAPPEN]

13 Apr. 1966 32 p refs In DUTCH, ENGLISH, FRENCH, and GERMAN *Its* Vol. 5, No. EM-97 CFSTI: HC $2.00/MF $0.50

Abstracts and bibliographic notes are presented on the topics of general economy, industrial economy (including internal organization, cost analyses, financing, administration, and statistics), personnel (including planning, evaluation, and leadership), and logistics (including acquisitions, storage and moving, and materials planning and control). Transl. by J.O.

N66-27218# Institute for Research, State College, Pa.

PURPOSIVE SYSTEMS THEORY AND APPLICATION Final Report, 1 Apr. 1963–30 Jun. 1964

H. Edward Massengill, Jr. Bedford, Mass., AFSC, Electron Systems Div., Jul. 1964 48 p refs

(Contract AF 19(628)-2968)

(ESD-TDR-64-531; AD-609377) CFSTI: HC $3.00/MF $0.75

The purpose of this paper is to summarize the approach and theory on which the research performed is based. Basically, the approach is the use of decision theory, with the assumption that people behave optimally given their formulations and constraints, to study the significant tasks that people perform. The ultimate goal of the approach is to map human behavior onto logic and mathematics. The emergence of the approach is given along with four basic requirements that we make of any theory to be used in understanding the behavior of individuals. The approach is contrasted with more traditional approaches. The procedure of the approach, task analysis, is explained and is illustrated by examples from the contract research. The place of applications in the approach is dealt with extensively. The paper includes a guide to the more important ideas dealt with in the contract research with references to the relevant contract publications. Abstracts of these publications, seven completed and seven in preparation, are also included. Author (TAB)

N66-27753*# Washington Univ., St. Louis, Mo. Dept. of Economics.

PROGRAM BUDGETING: APPLYING ECONOMIC ANALYSIS TO GOVERNMENT EXPENDITURE DECISIONS

Murray L. Weidenbaum Apr. 1966 29 p refs *Its* Paper No. 6602

(Grant NsG-342)

(NASA-CR-75492) CFSTI: HC $2.00/MF $0.50 CSCL 05C

This paper discusses the new Planning-Programming-Budgeting System (PPBS) of the Federal Government, which represents a major advance in the application of economic analysis to public finance decision making. Antecedent developments in the economic analysis of governmental expenditure decisions are reviewed and related to the current budget reform movement. The PPBS is based on the introduction of three major concepts into Federal Government operations: the development in each government agency of an analytical capability to examine in depth both agency objectives and the various programs to meet these objectives, the formation of a five-year planning and programming process coupled with a sophisticated management information system, and the creation of an improved budgeting mechanism which can take broad program decisions, translate them into more refined decisions in a budgetary context, and present the results for presidential and congressional action. The framework of the system, some long term impacts, and future prospects are also discussed. R.N.A.

N66-27901 Mitre Corp., Bedford, Mass.

SUMMARY OF EFFORTS EXPENDED ON THE CONCEPT OF "DYNAMIC UPDATE OF A MICROFILM FILE"

George Barboza Bedford, Mass., AFSC, Electron. Systems Div., Aug. 1965 94 p refs

(Contract AF 19(628)-2390)

(TM-04024; ESD-TR-65-90; AD-620279) CFSTI: HC $3.00/MF $0.75

A description is given of the hardware developed as a feasibility prototype for a dynamically updatable microfilm information storage, retrieval, and display system. Dynamic updating is accomplished by using a magnetic strip on the microfilm in conjunction with read/write circuits. Data are stored in binary coded decimal format, 32 numerical characters of changeable information or 128 bits to each microfilm image, giving a total magnetic storage capacity of more than 300,000 bits for a 100-foot reel. A variable word length was assigned. A consecutive search capability was built to improve the retrieval response times associated with the forward-only search technique in commercial reader/retrievers. Consecutive search is defined as the capability to store the present position or frame number location on the film reel and search in either direction (i.e., forward or reverse). Logically, first-stage comparison determines the relative location of a desired frame number with respect to present position along the length of a film reel. If the reel had just been loaded, the contents of the frame counter shift register is zero. For previous requests, the contents of the frame counter shift register will be a direct indication of present position within the film reel. Three possible logical decisions are made as a result of the first stage comparison.

TAB

N66-28565*# National Aeronautics and Space Administration, Washington, D. C.

THE ACHIEVEMENT OF SPACE: VALUES AND DIRECTIONS

Robert C. Seamans, Jr. 15 Mar. 1966 31 p 1st Ann. Dr Robert H. Goddard Lecture of the Natl. Space Club

(NASA-TM-X-57527) CFSTI: HC $2.00/MF $0.50 CSCL 05A

The pivotal concept that has guided NASA administration is defined by Dr. Robert C. Seamans, Jr., NASA Deputy Administrator, as the relation of the research and development project ot the many rapidly growing disciplines of science and technology. Project planning is discussed from this context, and the interrelationships of manpower requirements, the scheduled advances from concept, to design, to test, and actual operation; and program management are delineated. It is emphasized that a project team must operate within the agency's across-the-board management structure; that detailed regulations control the procurement cycle; that resource requirement estimates must be developed according to agency operating plan and budget procedures; and that status reports must be prepared in standard formats. Six representative project problems are cited as representative examples of the kind of experience from which useful management generalizations can be drawn. The involvement of the university–industry–government team in the research and development effort is stressed, and the potential applications of space achievements to nonspace use is discussed.

M.G.J.

N66-29268# California Univ., Berkeley. Operations Research Center.

ON OPTIMAL DEVELOPMENT IN A MULTI-SECTOR ECONOMY

David Gale Apr. 1966 44 p refs

(Contract Nonr-222(83))

(ORC-66-11; AD-632495) CFSTI: HC $2.00/MF $0.50

An economy is considered that has n goods and k types of labor, each of which is growing at the same constant rate. Goods are produced from labor and other goods by a set of specified activities. Given an initial supply of goods and amounts of labor. All possible production programs running from the present time to infinity through discrete time periods are considered. With each program is associated a utility sequence measuring the satisfaction achieved by the program at each period of time. A program is optimal if its utility sequence overtakes all other such sequences. The paper is devoted to proving the existence of optimal programs for a wide class of economies and to deriving the properties of such programs. In particular it is shown that the optimal program approaches a certain balanced program. Essential use is made of the existence of an infinite sequence of optimal prices with respect to which the optimal program is one which maximizes the sum of profit and utility at each time period.

Author (TAB)

N66-29269# General Electric Co., Huntsville, Ala.

GENERALIZED FORM CONTROLLED INPUT PROGRAM

Philip Crabb Huntsville, Ala., Redstone Sci. Inform. Center Mar. 1966 30 p

(Contract DA-01-021-AMC-242(Z))

(RSIC-541; AD-632208) CFSTI: HC $2.60/MF $0.50

This report describes a computer program for an 8K IBM 1401 Computer designed to test the hypothesis that a generalized program can be written to identify and format data elements in paper tape records generated as a by-product of filling in any standard form on a keyboard-operated paper tape device. Input to this program is provided by a utility run which converts paper tape records to magnetic tape images of those records rather than accepting input directly from paper tape. The standard form is described to the program by means of control cards which specify the data elements, their respective locations on the form, and the data element code (3-character identifier) to be assigned to each data element. A maximum of 110 data elements can be accommodated. Using the control cards as criteria, the program evaluates the paper tape data in terms of functional codes (Carriage Returns, Tabs, Backspaces, etc.) to identify data elements, justify them accordingly, perform minor edits, and assign appropriate data element codes as required. In this prototype program, line length may not exceed 99 characters and the number of lines may not exceed 99.

Author (TAB)

N66-29484# System Development Corp., Santa Monica, Calif

RESEARCH INTO THE MANAGEMENT OF COMPUTER PROGRAMMING: A TRANSITIONAL ANALYSIS OF COST ESTIMATION TECHNIQUES

G. F. Weinwurm and H. J. Zagorski Nov. 1965 221 p refs Includes errata sheet

(Contract AF 19(628)-5166)

(TM-2712/000/00; TM-2712/000/00A; AD-631259) CFSTI: HC $6.00/MF $1.25

The report embodies results of a continuing research effect on development of management guidelines, standards, and techniques of computer programming. The report focuses on a statistical analysis of 74 completed computer programming jobs in terms of their resource-costs and related variables. The primary results are: indices of job difficulty, job type, development environment, and job uniqueness; a costliness factor that permits programming tasks to be ranked in this respect; weighted composites of the indices for estimating the cost of particular programming jobs; and scoring and confidence-band techniques for blending intuitive managerial judgments with the formal cost-estimation procedures. Supplementary findings include indications of the relative sensitivity of job cost to changes in the values for the indices, and preliminary comparisons of resource usage between programs produced in machine-oriented or procedure-oriented languages. Recommendations are made for the collection of more accurate and current data on programming jobs during the production cycle, and the development of a census of computer programming, to enable the design of precise sampling experiments for subsequent analyses. Author

N66-29571*# George Washington Univ., Washington, D. C. Program of Policy Studies.

PLANNING, PROGRAMMING AND BUDGETING: A TECHNIQUE FOR FEDERAL PROGRAM PLANNING AND DECISION-MAKING

Robert G. Smith 24 Nov. 1965 32 p refs

(Grant NsG-727)

(NASA-CR-75897) CFSTI: HC $2.00/MF $0.50 CSCL 05A

A Presidential proposal for the adoption of a planning–programming–budgeting system by key government agencies is discussed, and its evolution and possible impact is analyzed. The integrated programming and budgeting system introduced into the Department of Defense, which resulted in more centralized decision-making, is assessed, and its impact on the defense industry is considered. The proposed system is defined as a management technique for systematically defining primary objectives and alternatives, then matching these objectives and alternatives to the appropriate resources within a structured information matrix. The technique is designed to assist top management in its planning, decision-making, and directive responsibilities. Inherent in the plan is a complex analytical process defined as systems, cost/utility, or cost effectiveness analysis. The current appropriations structure is compared with the suggested program structure for the Federal Transportation Program as an example of the changes which are involved. Details are also given on the proposed annual budget cycle which would operate over a 12-month period. Personnel acceptance or rejection of the system is viewed as a problem, and possible solutions are proposed.

M.G.J.

N66-29589# Applied Data Research, Inc., Princeton, N. J.

INFORMATION SYSTEM THEORY PROJECT. VOLUME I: MEM THEORY—A MATHEMATICAL METHOD FOR THE DESCRIPTION AND ANALYSIS OF DISCRETE, FINITE INFORMATION SYSTEMS Final Report

Anatol W. Holt, Spencer O. Chagnon, Robert M. Shapiro, and Stephen Warshall (Computer Associates, Inc.) Griffiss AFB, N. Y., RADC, Nov. 1965 194 p Prepared in part by Computer Associates, Inc., Wakefield, Mass.

(Contract AF 30(602)-3324)

(RADC-TR-65-377, Vol. I; AD-626819) CFSTI: HC $5.00/MF $1.00

A discrete information system may be abstractly conceived as a domain of 'entities' characterized as to the following: an ensemble of possible states of mutual relation; a collection of possible 'local' transformations of system state; and 'coupling' possibilities which determine how the system may interact with 'environments.' As between several such systems, relations such as 'behavioral equivalence' and 'representation' may be defined. In respect to computer systems, the most diverse information processing and/or exhibiting 'devices,' whether hard or soft or a combination of both, are to be amenable to mem-theoretic treatment. From the point of view of automata theory, mem-theory provides a method for constructing deterministic or non-deterministic finite state automata to explicate some informally-given interesting varieties of complex, discrete behavior. From such treatment, one is to obtain the capacity to describe, contrast and evaluate alternate organizational techniques and to be led to the invention of new ones. Author (TAB)

N66-29634*# McDonnell Aircraft Corp., St. Louis, Mo.

SPACECRAFT MANUFACTURING AND INPLANT CHECKOUT

Walter F. Burke *In* NASA. Manned Spacecraft Center Gemini Midprogram Conf. Including Expt. Results 1966 p 79-88 (See N66-29626 16-31) GPO: HC $2.75; CFSTI: MF $2.00

The importance of teamwork is stressed in the development of the Gemini spacecraft, and the corporate organization to assure maximum utilization of resources is discussed in connection with manufacturing and inplant checkout procedures. Both the Gemini modular concept of operations and the manufacturing working plan are reviewed, and management communications and procedures control are discussed and illustrated. Attention is given to spacecraft assembly, installation, white room checkout, the space simulation chamber, and spacecraft delivery. M.W.R.

N66-29636*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

LAUNCH VEHICLE MANAGEMENT

Willis B. Mitchell and Jerome B. Hammack *In its* Gemini Midprogram Conf. Including Expt. Results 1966 p 103-106 (See N66-29626 16-31) GPO: HC $2.75; CFSTI: MF $2.00

Management activity in the Gemini launch vehicle program centered on the selection of the Titan II launch vehicle and its adaptation to Gemini mission requirements. Necessary modifications to enhance the basic reliability of the Titan II through the use of redundant systems included changes in flight control and electrical systems. A malfunction detection system was incorporated to give the crew the necessary capability to diagnose impending problems and to determine proper action. A configuration management system, consisting of the Air Force Configuration Change Board and members of the NASA Gemini Program Office, was formed to coordinate modification activities. G.G.

N66-29802# Texas Univ., Austin. Linguistics Research Center.

RETRIEVAL SYSTEM EXPERIMENTATION AND EVALUATION AT LRC

A. G. Dale Dec. 1965 17 p refs

(Grant NSF GN-308)

(LRC-65-WT-2; AD-627791) CFSTI: HC $1.00/MF $0.50

A time-shared experimental document retrieval system under development at The University of Texas is briefly described. A method of evaluating the effect on retrieval performance of controlled changes in the retrieval processor is proposed. (Presented at the NATO Advanced Study Institute on Evaluation of Information Retrieval Systems, The Hague, July 12-23, 1965). Author (TAB)

N66-29966*# National Aeronautics and Space Administration, Washington, D. C.

FORECASTS AND APPRAISALS FOR MANAGEMENT EVALUATION, VOLUME I

[1965] 229 p refs

(NASA-SP-6009, Vol. I) CFSTI: HC $3.75/MF $1.25 CSCL 09B

Forecasts and Appraisals for Management Evaluation (FAME), an operations research system concerned with applying scientific methods to problems facing management, is described. Forecasting concepts and utilization of a general data-handling system with particular application to weight/performance control are presented to assist managers and contractors on the Apollo Program. Techniques are applied to the weight/performance control of spacecraft, launch vehicles, and respective functional systems. Exhibits of work sheets, printouts, and reporting forms to management accompany the discussion. The design requirements, executive routine, and operation of the FAME computational system are examined. Types of information and methods of transmitting data to management are illustrated by charts and graphs. Application of FAME to areas such as cost, schedule, vehicle performance, and electrical power surveillance is pointed out. S.P.

N66-30323# Joint Publications Research Service, Washington, D. C.

CYBERNETICS AIDS ANALYSIS OF THE PRODUCTION PLANNING PROCESS IN THE EAST GERMAN MACHINE-BUILDING INDUSTRY

J. Winkelmann 6 Jul. 1966 19 p Transl. into ENGLISH from Fertigungstech. und Betrieb (Berlin), no. 5, May 1966 p 278-282

(JPRS-35321; TT-66-32753) CFSTI: $1.00

Long-range and operational planning are considered in terms of tasks and time requirements that can be aided by introducing the methods of cybernetics and mathematical analysis. While it is pointed out that there is at present no useful cybernetic model for the structure and behavior of management processes, attention is given to a control loop and a simple block diagram for making up a balance which employs the techniques of cybernetics. A typical process of production planning is analyzed and illustrated. M.W.R.

N66-30361*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

PROGRAM DOCUMENTATION

Howard R. Stagner Feb. 1966 19 p

(NASA-TM-X-55538; X-564-66-73) CFSTI: HC $1.00/MF $0.50 CSCL 09B

A discussion of programming documentation, the need for it, its functional role, and structure is given, followed by a detailed outline of requirements for complete documenta- Author

N66-30520# RAND Corp., Santa Monica, Calif.

SOME ASPECTS OF THE ALLOCATION OF SCIENTIFIC EFFORT BETWEEN TEACHING AND RESEARCH

Michael D. Intriligator and Bruce L. R. Smith Mar. 1966 28 p refs

(Contract AF 49(638)-1700; Proj. RAND)

(RM-4339-PR; AD-632166) CFSTI: HC $2.60/MF $0.50

The study considers some aspects of the allocation of scientific effort by means of an analytic framework consisting of specified policy objectives and a model for the allocation of new Ph.D.s in science between teaching and research. Some simplifying assumptions lead to a general welfare function for this aspect of a national science policy. The production of new scientists is determined in the model by a production function, dependent on teaching scientists and on time. For any of the special cases of the welfare function and for a production function with a constant ratio of new scientists to teaching scientists, an initial allocation of a maximum proportion of new scientists to teaching is preferred, followed by a switch to a minimum proportion of new scientists to teaching. Similar 'switching' solutions also apply to a wider class of objectives and production functions. The analytic framework and preferred allocations are briefly examined with respect to 'real world' considerations and to their possible implications for national policy. Several policy initiatives are discussed in light of the model and some possible changes are suggested in government policies on R and D support and aid to science education. Author (TAB)

N66-30756*# George Washington Univ., Washington, D. C.

MAJOR FACTORS IN AEROSPACE PLANNING AND DECISION

Robert G. Smith 10 May 1966 184 p refs

(Grant NsG-727)

(NASA-CR-76298) CFSTI: HC $5.00/MF $1.25 CSCL 05A

An analysis of economic, technical, and socio-political factors considered by aerospace industry managers in their long range planning and decision making functions was conducted, to focus attention on the interdisciplinary aspects of the space-age planning process. Personal contact was made with managers of various government agencies and aerospace companies to determine management's role in decision making, and it was concluded that there was no universally acceptable planning format for all companies in all situations. It is intended that this analysis offer general insight into the challenges and problems facing aerospace industry managers. The impact on the aerospace industry of such variables as the war in Vietnam, Soviet technological advances, and the cold war are evaluated; and the conclusions and recommendations generated from this study are listed. H.S.W.

N66-31130# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.

ECONOMIC EQUILIBRIUM

Kenneth J. Arrow 31 Mar. 1966 35 p refs Submitted for Publication

(Contract Nonr-225(50))

(TR-142; AD-630666) CFSTI: HC $2.00/MF $0.50

A brief history of the concept of general economic equilibrium is presented, with special emphasis on the development of the field since 1932. This is followed by a fairly detailed survey of the present known results on the existence of competitive equilibrium and briefer surveys of other topics, specifically the optimality of competitive equilibrium, the concept of the core, uniqueness of competitive equilibrium, stability, comparative statics, and equilibrium over time. TAB

N66-31248# System Development Corp., Santa Monica, Calif.
SDC RESEARCH AND TECHNOLOGY DIVISION EXTERNAL PUBLICATIONS, 1961-1965
C. Baum and L. D. Wilhelm 1 Mar. 1966 24 p refs
(TM-698/065/00; AD-632481) CFSTI: HC $1.00/MF $0.50

The document presents a complete listing of external publications by SDC's research and technology division staff members and consultants. The present issue lists journal publications, papers in conference proceedings, books, and book chapters for the years 1961-1965 inclusive, grouped in general according to subject matter. Author (TAB)

N66-31272# System Development Corp., Santa Monica, Calif.
TRENDS IN COMPUTER HARDWARE
Charles Fanwick 17 Mar. 1966 35 p
(SP-2393; AD-632477) CFSTI: HC $2.00/MF $0.50

The capabilities of elements of data processing systems which might be expected to be economically available about 1971 are described. This description is based on an extrapolation by the writer of the present state-of-the-art. Systems are hypothesized containing these capabilities in their parts. It is shown that these systems have capabilities inherent in the hardware which are now expected to be provided only by sophisticated software developments. It is emphasized that software system designers should anticipate hardware capabilities which will be available at the time when their software systems are expected to be available. Author (TAB)

N66-31376*# National Bureau of Standards, Washington, D. C.
THE NBS CORD TIME SHARING SYSTEM
Thomas N. Pyke, Jr. 1 Apr. 1966 26 p
(NASA Order R-09-022-039)
(NASA-CR-76398; NBS-9339) CFSTI: HC $2.00/MF $0.50 CSCL 09B

Described is a CORD (Computer with On-line Remote Devices) operating system consisting of an executive program designed to enable the dual-processor computer facility with multiple remote terminals to operate in a time-shared mode. It is pointed out that programs and data can be entered into the system at each remote terminal, including teletypes and display subsystems, the program execution initiated, and results returned to the terminals. This reference manual contains information for users of the CORD system from a teletype terminal. A method for entering system commands, and a description of the program run in the time-shared mode is included, as are user program operation codes and command vectors. Error returns and error numbers accompanied by a listing of internal character representations are summarized.

N66-33171*# National Aeronautics and Space Administration, Washington, D. C.
[MANAGEMENT OF SCIENCE]
B. C. Meyers, II [1964] 13 p Presented at the Intern. Management Conf., SAM, N. Y., 16 Oct. 1964
(NASA-TM-X-54866) CFSTI: HC $1.00/MF $0.50 CSCL 05A

This discussion presents a general picture of NASA's concept, philosophy, and general approach to research management. NASA's management provides constructive guidance by beginning with the establishment of technological goals to be achieved in a measurable time period. This automatically leads to the necessity for continuing assessment of the progress toward these goals which provides the basis for the judgements that allow the course toward these long goals to be altered. NASA's management effort is built on a pyramid organization for administrative purposes, but with a flat and direct approach to the scientific and engineering activities. Inherent in the scheme is the fact that 85% of the work is applied research with the other 15% devoted to basic research. NASA's management concept stresses the communication of ideas, theories, and discoveries throughout the scientific and engineering community which includes a program for the publication and exchange of information. It has cooperative programs with foreign countries and supports and sponsors university research, training, and space experiments. Other aspects discussed include the recognition of individual productivity, encouragement of scientists to publish their works, and educational assistance. R.N.A.

N66-31894*# General Electric Co., Santa Barbara, Calif. TEMPO Div.
APPLICATION OF AEROSPACE TECHNOLOGIES TO URBAN COMMUNITY PROBLEMS
M. L. Feldman, L. A. Gonzalez, and A. B. Nadel 23 Sep. 1965 185 p refs
(NASA Order R-5177)
(NASA-CR-76524; RM-65TMP-53) CFSTI: HC $3.25/MF $1.25 CSCL 05K

This study was conducted to clarify the manner in which NASA-developed technology can be used to help existing cities improve their physical, social, and economic environments by resolving some of the more immediate and critical problems in these environments and to aid in planning and developing new urban communities. An evaluative matrix is shown which relates the major ecological categories and subcategories of critical city problems to the major NASA technological categories. The matrix summarizes and classifies the critical city problems identified and discussed in this report and presents the problems in a framework of opportunities for applying technological solutions using NASA-developed technologies. The critical city problems are identified through discussions of the background, nature, and impact of each problem. The study shows that NASA can contribute to the solution of urban community problems through the application and transfer of its technologies. The appendices discuss the application of systems analysis to the municipal police system and waste management, a methodology for hospital and medical facilities planning, and the concept of enclosed communities. R.N.A.

N66-32287*# California Univ., Los Angeles. Graduate School of Business Administration.
FUNCTIONAL AMBIGUITY AND THE CUSHIONING OF ORGANIZATIONAL STRESS
Fred Masarik [1965] 19 p ref Sponsored by NASA
(NASA-CR-76698) CFSTI: HC $1.00/MF $0.50 CSCL 05J

The positive aspects of ambiguity and its function in cushioning organizational stress is discussed. A curvilinear function relating ambiguity to organizational effectiveness shows that optimal effectiveness exists at some intermediate point between maximum ambiguity and maximum clarity. It is pointed out that too little ambiguity limits adjustment to change for individuals and organizational subsystems, and too much ambiguity impedes effectiveness by creating anixiety for individuals and by obscuring guidelines for organizational survival. Several case examples of this ambiguity principle in management operations are presented. A.O.

N66-33280# MITRE Corp., Bedford, Mass.
HOW TO ESTIMATE THE INVESTMENT COST OF ELECTRONIC DATA PROCESSING EQUIPMENT
Martin V. Jones Bedford, Mass., AFSC, Electron. Systems Div., May 1966 39 p refs
(Contract AF 19(628)-5165)
(MTR-70; ESD-TR-66-71; AD-633878) CFSTI: HC $2.00/MF $0.50

This document seeks to provide practical guidance to analysts charged with estimating the investment costs of the electronic data processing equipment of Air Force Command and Control systems. The document is also offered as a methodological prototype for writing similar item-oriented reports on other major items or Air Force systems, such as communications equipment, radar, sensors, display equipment, computer programming, and the major subsystems of aircraft, ballistic missiles, and space systems. Author (TAB)

N66-33396*# Texas Univ., Austin.
RADIO ASTRONOMY SIGNAL SPECTRUM ANALYSER
John H. Sizelan (M.S. Thesis) Sep. 1965 36 p refs
(Grant NsG-432)
(NASA-CR-77009) CFSTI: HC $2.00/MF $0.50 CSCL 09F

A device is described for the automatic processing of data by the receiver of a radio telescope. Using a minimum number of components, the device samples, stores, and sums data as well as presents the composite scan at the receiver site. The trigger determines the instants when signal samples are taken; and a motor driven cam-microswitch assembly produces a short negative pulse to the analog-to-digital converter, consisting of a galvanometer-driven signal which directs a light beam on a series of photodiodes which gate the pulses out of the trigger. The crossbar stores the information of one scan and controls the register which displays the composite scan. Design is discussed, along with instrumentation details and operating procedures. A spectrum analyser test and performance results are included. M.W.R.

N66-33361# System Development Corp., Santa Monica, Calif.
[TIME-SHARING, DATA BASE SYSTEMS, COMPUTER PROCESSING OF NATURAL LANGUAGE, AND THE RESEARCH AND TECHNOLOGY LABORATORY] Semiannual Technical Summary Report, 18 Nov. 1965-17 May 1966
C. Baum, ed. [1966] 54 p
(Contract AF 19(628)-5166; ARPA Order 773)
(TM-687/006/00; AD-633930) CFSTI: HC $3.00/MF $0.50

This report describes work done in the ARPA-sponsored information processing techniques and command and control research and laboratory program for 18 November 1965 through 17 May 1966. Projects covered are time-sharing, data base systems, computer processing of natural language, and the research and technology laboratory. Author

N66-33635# System Development Corp., Santa Monica, Calif.
COMPUTERIZATION: SOME IMPLICATIONS FOR DECISION MAKING
G. H. Perry 30 May 1966 17 p refs
(SP-2487; AD-633908) CFSTI: HC $1.00/MF $0.50

Decision making is discussed both in a broad economic context and in a specific definitional sense, and is then related to the information revolution, or computerization. The directional and dimensional changes in the decision making process that appear to be imminent or already underway are described, and predictions are made of the effects these changes will have upon managers' jobs in the near-term future. Author (TAB)

N66-33837# RAND Corp., Santa Monica, Calif.
PROCEDURES FOR ESTIMATING THE RESOURCE REQUIREMENTS OF MANNED SPACE FLIGHTS
Joseph String Jun. 1966 30 p Presented at the Spring Meeting of JSGOMRAM, Boston, 27 Apr. 1966
(P-3382; AD-634085) CFSTI: HC $2.00/MF $0.50

The paper is addressed to three principal topics: (1) what a typical manned space flight plan looks like; (2) procedures employed in evaluating the resource impact of alternative space flight proposals, either projects or plans; (3) the resource implications of some of the major types of activities currently being considered in NASA's long-range planning. TAB

N66-34486# Joint Publications Research Service, Washington, D. C.
CYBERNETICS AND AUTOMATION
D. A. Oshanin, ed. 17 Aug. 1966 290 p refs Transl. into ENGLISH of the Book "Sistema Chelovek i Automat" Moscow, Nauka Publishing House, 1965 p 1-252
(JPRS-37072; TT-66-33501) CFSTI: $6.00

Articles on the problems and aims of the study of complex control systems, methods of studying "man and automaton" systems, regularities of human perception and processing of information, and studies of the functional capabilities of human operators are presented. For individual titles see N66-34487-N66-34514.

N66-34069*# California Univ., Berkeley. Space Sciences Lab.
ON LARGE MODELS OF SYSTEMS
C. West Churchman Jun. 1966 22 p Presented at 2d Stony Brook Conf. on Advances in Computing, N. Y., Jun. 1966 *Its* Internal Working Paper No. 39
(Grant NsG-243-62)
(NASA-CR-77105) CFSTI: HC $1.00/MF $0.50 CSCL 05K

A theoretical discussion is presented of difficulties in attempts to rationalize large social systems, such as governments, industrial firms, universities, or hospitals by search for central quantitative measures of system performance. These measures, or desirable qualities, are then related to the feasible activities of the particular system in order to enhance man's understanding of the system; and the mathematics which relates these activities to the desirable quantities is dubbed an objective function. Objective functions can then be maximized by use of constraint equations. While the problems inherent in rationalizing human systems by large models are many, it is emphasized that we should not abandon efforts in this direction. M.W.R.

N66-34229# Army Foreign Science and Technology Center, Washington, D. C.
EFFECT OF HIGH DOSES OF GAMMA RAYS OF Co^{60} ON POTATO STARCH
S. E. Traubenberg, K. A. Korotchenko, and I. N. Putilova Jun. 1966 12 p refs Transl. into ENGLISH from Izv. Vysshikh Ucheb. Zavedenii, Pishchevaya Tekhnol. (Krasnodar), no. 6, 1965 p 24-28
(FSTC-HT-23-106-66; TT-66-61515; AD-634415) CFSTI: HC $1.00/MF $0.50

Experimental data are presented on high dosage irradiation of potato starch using Co^{60}. Doses up to 94 mrad were used and dissociation products were analyzed. Free radicals were found to exist for extended periods in irradiated potato starch. Author (TAB)

N66-34366*# National Aeronautics and Space Administration, Washington, D.C.
INDEX TO NASA TECH BRIEFS, JANUARY-JUNE 1966
Aug. 1966 62 p refs
(NASA-SP-5021(03)) CFSTI: HC $1.00/MF $0.75 CSCL 05B

An annotated bibliography is presented of NASA Tech Briefs, along with subject and number indexes. Annotations are given under the following categories: (1) *Electrical (Electronic)*, (2) *Physical Sciences (Energy Sources)*, (3) *Materials (Chemistry)*, (4) *Life Sciences, and (5) Mechanical.* M.W.R.

N66-34494# Joint Publications Research Service, Washington, D. C.
ON THE CREATION OF A "MAN AND AUTOMATON" SYSTEM AND ON SOME ASPECTS OF ITS STUDY
V. F. Venda *In its* Cybernetics and Automation 17 Aug. 1966 p 59-67 refs (See N66-34486 20-05) CFSTI: $6.00

An example is given of a direct interaction of man and automaton in which the quality of the man's performance in controlling depends to a decisive degree on how the information received on the operations of the control computers is organized. A method of checking the data represented on the information panel is described, in which the theory of algorithms is used to analyze the mimic flowsheet of a large heating and power station. Details are also given on an experimental system, including a simulator of the boiler-turbogenerator unit. This was developed in connection with an actual problem of designing the operator's station at a large thermal power unit completely automated with the use of a control computer. The importance of the operator's role is stressed in relation to the station design. Factors to be considered are listed as choice of information panel and method of depicting the controlled object; arrangement of signal elements and density of their distribution; color characteristics of the information panel and control desk; type of monitoring and measuring equipment, and the design of its reading parts; and the work room design. M.G.J.

N66-34497# Joint Publications Research Service, Washington, D. C.

ON THE FEASIBILITY OF SOLVING THE PROBLEMS OF THE DIAGNOSTICS OF MAN'S FUNCTIONAL CONDITION WITH THE HELP OF COMPUTERS

R. S. Dadashev and Ye. N. Murashov *In its* Cybernetics and Automation 17 Aug. 1966 p 92–112 refs (See N66-34466 20-05) CFSTI: $6.00

The problem of man and automation is examined with regard to checking the functional condition of man, especially the sick man, as the operator in a complex control system. The approach consists of an examination of methods of statistical processing of physiological parameters and storage of the results in the computer for automatic diagnosing. Values of a physiological parameter were obtained as a random quantity with a normal distribution law. Another approach to the problem is devoted to the probability methods in which the computer itself works out regions of symptom complexes with a small number of experiments, and during the diagnosis compares the current condition with the regions of conditions found automatically. Probability methods are applicable for determining the functional condition when there is no accumulated clinical material. A block diagram of a specialized computer for automatic diagnosis of man's functional condition is included. This automatic diagnosis predetermines the onset of a condition with a certain probability, making it possible to avoid extreme conditions in time. S.P.

N66-34540# Office of Naval Research, Washington, D. C.

INFORMATION SYSTEMS SUMMARIES

Richard H. Wilcox Jul. 1965 76 p refs

(ONR-ACR-113; AD-634526) CFSTI: HC $3.00/MF $0.75

Contents: general information sciences, machine interaction with humans, improved machines. TAB

N66-34894# RAND Corp., Santa Monica, Calif.

PURE COMPETITION, COALITIONAL POWER, AND FAIR DIVISION

Lloyd S. Sharpley and Martin Shubik Jun. 1966 57 p refs (Contract AF 49(638)-1700)

(RM-4917-PR; AD-634698) CFSTI: HC $3.00/MF $0.50

A new application of the mathematical theory of games to the conceptual foundations of the theory of economic competition is presented. The memorandum first gives a nontechnical discussion of three different types of solution to mathematical models of the marketplace, namely, the competitive equilibrium, the core, and the value, and relates them to three principles of distribution, namely, pure competition, coalitional power, and fair division. Several models are then analyzed in detail, first, numerical solutions are calculated for a class of symmetric market games, chosen to contrast the value with the other two solutions. Next, as the number of traders is increased, the convergence of all three solutions to a single outcome is proved for a general class of markets with money. Finally, an illustrative market model without money is evaluated explicitly as a function of the size of the market. This represents the first substantial application of a new definition of the value for games without side payments. The formal definitions are summarized in an appendix.

N66-35237*# California Univ., Berkeley. Space Sciences Lab.

AN APPROACH TO THE DESIGN OF A UNIVERSITY COMPUTER CENTER IN THE BEGINNING OF THE 1970's

Jean Yvon Birrien Jun. 1966 92 p refs *Its* Internal Working Paper No. 47

(Grant NsG-243-62)

(NASA-CR-77507) CFSTI: HC $3.00/MF $0.75 CSCL 09B

The problems involved and a methodology for the formulation of a theory of data processing systems are discussed, with particular attention to a system for a university computer center. The present tasks of a center and the projected needs of the 1970's are analyzed. The evolution of the system and of the scientist in the computer field are described, and the time sharing system is emphasized. Recommendations are given, and and an example of a time sharing center and its cost analysis are included. N.E.N.

N66-35641# Mitre Corp., Bedford, Mass.

AESOP: A GENERAL PURPOSE APPROACH TO REAL-TIME, DIRECT ACCESS MANAGEMENT INFORMATION SYSTEMS

Joseph Spiegel, John K. Summers, and Edward M. Bennett Bedford, Mass. AFSC, Electron. Systems Div., Jun. 1966 38 p Presented at the Am. Management Assoc. Meeting, New York, Feb. 1966

(Contract AF 19(628)-5165)

(MTP-33; ESD-TR-66-289; AD-634371) CFSTI: HC $2.00/MF $0.50

AESOP, a laboratory-based prototype of a general purpose, on-line, visually-oriented information system, is used to investigate ways of handling many different types and levels of command and management problems spanning organizational levels from the executive suite down through the staff and operations analysts to the actual system designers and programmers. In particular, it deals with those organizational activities that require highly flexible, direct-access capabilities, the system is configured for easy use by the inexperienced as well as by the sophisticated, and utilizes a variety of user station devices to facilitate such flexibility, including a cathode-ray-tube display, a lightgun, a typewriter, and associated push-buttons. At each station, it is capable of generating, editing, and formatting information on-line, as well as building

N66-35769*# Washington Univ., St. Louis, Mo. Dept. of Economics.

STARTING SALARIES OF ENGINEERS AND SCIENTISTS

Hugh Folk Aug. 1966 28 p refs *Its* Working Paper 6606 (Grant NsG-342)

(NASA-CR-77677) CFSTI: HC $2.00/MF $0.50 CSCL 05C

Changes in starting salaries of engineers and scientists during the postwar period are examined. Discussed are patterns of demand that have affected the market for engineers and scientists since World War II, changes in starting salaries of engineers relative to other occupations, changes within the field of engineering, and changes in the structure of engineers' salaries. C.C.W.

N66-35961*# George Washington Univ., Washington, D. C.

AN INVESTIGATION OF PROFIT RATES IN DEFENSE CONTRACTING

Charles E. Bradley, Kate A. Arbogast, Patrick Ross Huntley, and Clayton C. Mc Cuistion [1966] 132 p refs

(Grant NsG-425)

(NASA-CR-77868) CFSTI: HC $3.00/MF $1.00 CSCL 05C

An examination is presented of the cost of capital in selected industry groups, with emphasis placed on firms primarily involved with government contracting. Time series data and the customary ratio analysis for specific industry groups are given. An evaluation is shown of the overall profit outcomes in terms of a general measure of the cost of capital for the groups developed. Adaptations are made of models which capital theorists offer as descriptive of market behavior and normative for managerial decisions. A test is presented of the reasonableness of profits for renegotiation board objectives, and a summary description of the various profit theories of economics is included. C.T.C.

N66-36526# Brown Engineering Co., Inc., Huntsville, Ala.

A METHODOLOGY TO ANALYZE AND EVALUATE CRITICAL HUMAN PERFORMANCE

M. A. Barone *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 270–283 refs (See N66-36506 22-30)

A methodology to evaluate, analyze, and predict critical human performance is presented. The aim of the program is to develop a methodology to control and minimize the natural subjectivity associated with evaluation programs. The typical approach is: (1) analyze the system or task, (2) select evaluation factors, (3) establish and prevalidate a rating manual or check list, (4) perform an analysis and evaluation, (5) estimate potential error probabilities, and (6) perform critical comparison studies. Author

N66-36540# Martin Co., Denver, Colo.
MARTIN'S TITAN III INCENTIVES Progress Report, Jan. 1963–Mar. 1966
Robert W. Chapman *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 433-436 refs (See N66-36506 22-30)

The incentive contract, and resulting schedule performance, flight performance, and cost performance are described. The event and milestone scoring are mentioned. It was concluded that the successful experiences on the Titan III program prove that incentives do work towards motivating superior performance. It was further shown that success is contingent upon an excellent degree of program definition, and on the ability of management to bring all personnel in as participants. N.E.N.

N66-36541# Brown Engineering Co., Inc., Huntsville, Ala.
THE COMPATIBILITY OF VALUE ENGINEERING AND CONFIGURATION MANAGEMENT
Marvin Wasserman *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 437–451 refs (See N66-36506 22-30)

This report is aimed at management levels responsible for ensuring system compatibility and mission success. The report provides a familiarization with the philosophies of system management and the interrelationships of program management, system engineering, and management tools. Value engineering and configuration management are discussed as the catalysts to be integrated into the management network, thus assuring system compatibility and mission success at the lowest overall cost. Author

N66-36542# Radiation, Inc., Melbourne, Fla.
POTENTIAL AND HAZARDS OF THE OCEANOGRAPHIC MARKET FOR THE AEROSPACE INDUSTRY
Meryl C. Burns *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 452–465 (See N66-36506 22-30)

The oceanography market will provide a potential for diversification by the aerospace industry. An analysis of this market and the correlation between oceanographic requirements and aerospace resources establishes the relative potentials and hazards for selected market sectors. A minimum risk entry into the potentially profitable and diverse oceanography market is proposed. Author

N66-37179# George Washington Univ., Washington, D. C. Dept. of Statistics.
TOPICS IN INFORMATION AND DECISION PROCESSES Technical Report, Sep. 1964–May 1965
Minoru Sakaguchi Jul. 1966 161 p refs
(Grant Nonr(G)-00029-65)
(AD-635941) CFSTI: HC $5.00/MF $1.00

CONTENTS:

1. INDIVIDUAL DECISION-MAKING UNDER UNCERTAINTY 16 p refs
2. GAMES AND STRATEGIC INFORMATION–DUELS 11 p refs
3. GAMES AND STRATEGIC INFORMATION–POKER 13 p refs
4. SEQUENTIAL DECISIONING AND DYNAMIC PROGRAMMING 14 p refs
5. INTERPRETATIONS OF INFORMATION BY DECISION-MAKING MODELS 12 p refs
6. STATISTICAL DECISION PROBLEMS AND BAYES SOLUTIONS 13 p refs
7. INFORMATION, EXPERIENCE AND LEARNING 11 p refs
8. RELATIONSHIPS BETWEEN INFORMATION THEORY AND DECISION THEORY 12 p refs
9. AMOUNT OF INFORMATION PROVIDED BY A DICHOTOMOUS EXPERIMENT 27 p refs
10. SOME EXAMPLES OF BAYESIAN ADAPTIVE PROGRAMMING 28 p refs

N66-36601# Michigan State Univ., East Lansing. Div. of Engineering Research.
A SYSTEMS APPROACH TO HIGHER EDUCATION—A COMPREHENSIVE REPORT OF PROGRESS
H. E. Koenig, M. G. Keeney, M. J. King, P. Gindre, J. E. Griggs et al 15 May 1966 101 p refs
(Contract NSF C-396)
(IR-3)

The report presents a first generation model characterizing the dynamic relationship between the flow of students and resources and their associated imputed values at the "input and output terminals" of an institution of higher education. The model is a system of simultaneous difference equations whose coefficients are stated as an explicit function of the academic programs of the students and the administrative policies of the institution; it identifies 96 internal student population levels and the demands placed on the institution by their academic programs and the resources and the associated unit costs required to meet these demands. Data acquisition and processing procedures are given for evaluating those parameter matrices in the model for which a data base accessible to a computing machine is currently available. A data processing system that will provide the additional required data base is also described. The model enables the administrator to experiment with various combinations of policy and resource allocations. The interaction of higher education with the national economy is demonstrated in terms of a simplified version of the basic model. In addition to the number of students, manpower and resources, and their associated imputed values, other dimensions of education are given as they relate to academic and administrative policy, cost, and student interest. Author

N66-37074# Massachusetts Inst. of Tech., Cambridge.
FREEDOM AND CONTROL: THE DILEMMA OF CREATIVITY IN THE ORGANIZATIONAL ENVIRONMENT
Harper Brown Keeler (Ph.D. Thesis) Jun. 1966*271 p refs
(AD-635261) CFSTI: HC $1.50/MF $1.50

The purpose of this study is the analysis of creativity in the context of organizations found in an advanced modern social system. The report deals with a critique of the literature related to the problems of creativity in organizations, with these criticisms in mind, the second part compares different organizations ranked by levels of creativity. Different factors of the environments (especially those relating to organizational control and feelings of individual freedom) which influence creativity levels are analyzed. Eight environments were chosen for study to include industrial labs, government labs, and academic labs. The first case study analyses the severe constraints on creativity which can occur in an organization operated under public health regulation. Four labs that exhibit different levels of creativity are compared. Propositions are generated to explain these differences. These propositions are tested in three academic labs which are assumed to have more creative environments. The conclusions include recommendations for altering the theoretical framework offered by the literature, and recommendations for organizations wishing to foster creativity in their participants. TAB

N66-36543# International Business Machines Corp., Bethesda, Md.
AUTOMATION IN RANGE SCHEDULING
John R. Norton *In* Canaveral Council of Tech. Soc. 3d Space Contr. 1966 p 466–478 refs (See N66-36506 22-30)

An operations research model for the range scheduling function is presented. The techniques were derived from an analysis of the Eastern Test Range, however, they are applicable to many cases of the general large project scheduling problem. It is shown that certain scheduling jobs are amenable to automation, and the methodology is illustrated with test cases. H.S.W.

N66-37529# California Univ., Los Angeles. Div. of Research.
AN EVALUATION OF BARRIERS TO THE DELEGATION OF AUTHORITY IN FORMAL ORGANIZATIONS
Patrick Meacham Williams (San Jose State Coll.) Jul. 1966 20 p refs
(NASA-RP-13)

A number of "barriers" to effective authority delegation were grouped into categories associated with the manager, his subordinates, and his organization. Sixty-five managers were then asked to evaluate the importance of each of these obstacles by means of numerical ratings, open-end written responses, and individual interviews. The major results of this survey established the following reasons for the inability to delegate decision making: (1) The manager viewed his subordinate as the principle barrier to delegation; (2) the manager remained basically confident in himself as a decision maker and rated his own ability higher than any other barrier to delegation; (3) the manager's impatience to develop the decision making ability in others. G.G.

N66-37542*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
THE R & D FACTOR IN INTERNATIONAL TRADE AND INTERNATIONAL INVESTMENT OF UNITED STATES INDUSTRIES
William Gruber, Dileep Mehta, and Raymond Vernon Jun. 1966 46 p refs
(Grant NsG-496)
(NASA-CR-78382; CSR-TR-66-8) CSFTI: HC $2.00/MF $0.50 CSCL 05C

The functioning of research and development in the creation of new products, new processes, and new systems that lead to industrial concentrations and large scale operations of United States industries in the framework of international trade are studied. International economic investments constitute a certain hold on export positions through their subsidiarized sales force; but neither exports nor overseas investment have much prominence when normalized by the level of activities of the same industries in the United States. G.G.

N66-37616# Union Carbide Nuclear Co., Oak Ridge, Tenn. Central Data Processing Facility.
U CAPP: UNION CARBIDE APT POST PROCESSOR
A. H. Fowler, R. W. Henderson, R. V. Miskell, R. E. Neu, W. V. Schellinger et al 14 Jun. 1966 42 p 1st ed.
(Contract W-7405-ENG-26)
(K-1670) CFSTI: HC $2.00/MF $0.50

UCAPP, the Union Carbide APT Post Processor, is a computer program which processes the output of the APT computer system into control tapes for numerically controlled machines. It is generalized to handle a wide variety of N/C machines. Author (NSA)

N66-37813*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE TASK MANAGER
William D Carpenter Oct. 1965 14 p refs
(NASA-TM-X-53341; X-542-65-445) CFSTI: HC $1.00/MF $0.50 CSCL 09B

Principles and objectives of management are discussed in an informal manner. The requirements for successfully planning a job are presented from the viewpoint of the data systems task manager. A breakdown of major milestones such as abstracting, system analysis and design, system description, flow charting, coding, checkout, simulation, and documentation is given, and instruments for scheduling and reporting are recommended. A.G.O.

N66-38241# University of Southern Calif., Los Angeles. Dept. of Psychology.
COMPUTER PERSONNEL SELECTION AND CRITERION DEVELOPMENT. III: THE BASIC PROGRAMMING KNOWLEDGE TEST
Joseph W. Rigney Jun. 1966 51 p refs
(Contract Nonr-228(22))
(TR-49; AD-636988) CFSTI: HC $2.00/MF $0.50

The Basic Programming Knowledge Test (BPKT), is intended to stand by itself as a criterion of programming proficiency. To achieve a close correspondence of test content to programming job requirements, subject-matter experts participated in the construction and review of the test questions. Test questions were selected that met the criteria of discrimination and appropriate difficulty, as indicated by the statistical analysis of results of a large preliminary testing. The final form of the test consists of 100 multiple-choice questions that are designed to be free of references to specific computers and languages now in use. Normative scores were developed for Navy computer groups. The relationships of the BPKT test scores to a number of vocational and education variables are described. Author (TAB)

N66-38742# Ballistic Systems Div., Norton AFB, Calif.
AIR FORCE/INDUSTRY DATA MANAGEMENT SYMPOSIUM
[1965] 343 p Proc. of Symp. held Beverly Hills, Calif., 28-30 Sep. 1965 Sponsored by Air Force and Aerospace Industries Assoc.
(AD-626032) CFSTI: HC $7.00/MF $1.50

The objectives of the Air Force/Industry Data Management Symposium were: (1) to re-examine the objectives of data management system; (2) to explore and evaluate the effectiveness of data management and control; (3) to determine and resolve existing problem areas; and (4) to increase the effectiveness of data management. To accomplish these objectives, the data management spectrum was divided into five categories: data management concepts, contractor data acquistion, rights in data and warranty cost of data, and new frontiers of data management. Based on this division, the Symposium was organized into five operating panels, each jointly chaired by an Air Force and an industry representative. Each panel was further organized into detailed topic areas with members assigned to analyze, study, and develop tentative findings for consideration at the panel sessions. These findings were presented at the Symposium panel meetings. The ensuing panel discussions provided a basis for formulating recommended solutions to the various problems. TAB

N66-38746*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A MANAGEMENT PLAN FOR SYSTEMS ASSURANCE DURING PHASES A, B, C, AND D
Preston T. Farish 14 Sep. 1966 40 p
(NASA-TM-X-53516) CFSTI: HC $2.00/MF $0.50 CSCL 05A

A plan is presented for organizing the activities and end products of the reliability, quality, maintainability, system safety, and human engineering discipline into a team effort wherein each complements and augments the normal functions of the other. It is pointed out that this provides both maximum management visibility and total system impact with minimum personnel and cost. The plan features a functional block diagram, arranged by phases, that combines the major program elements of all of the disciplines into a single point management tool. The organizational relationships and responsibilities, and the functional working relationships are described. M.G.J.

N66-38778# Joint Publications Research Service, Washington, D. C.

A LINEAR EXCHANGE MODEL

I. G. Globenko 19 Sep. 1966 12 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 169, no. 2, 1966 p 295-298

(JPRS-37708; TT-66-34137)

Recurrent expressions are written to determine daily level of production and inventory, assuming that the coefficient which expresses increase in turnover is identical in all branches of the economy. The equations are written in vector form; the characteristic equation is constructed; and specific cases are considered when the roots are real and different, when they coincide, and when they are complex-conjugate. For purposes of geometric classification, distinction is made for three sets: (1) spirals which go out from the origin and spiral to infinity, (2) circles with a common center at the origin, and (3) spirals which go out from an infinitely remote point toward the origin. It is noted that with a change of orientation of the linear system, there is a change in the orientation of the economic motion changes; and for all three of the cases, the nature of the model is considered depressive. M.W.R.

N66-39002# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ORGANIZATION AND METHOD OF THEMATIC SEARCH AND CREATION OF INFORMATION PRECEDING NEW DEVELOPMENTS

G. I. Gol'dgamer *In its* Sci. Tech. Inform. 21 Feb. 1966 p 1-21 (See N66-39001 24-34) CFSTI: HC $2.00/MF $0.50

Described are experiences of a scientific research institute gained in the field of thematic information search in support of technological projects, research, and investigations. Emphasized is the importance of obtaining information prior to the start of a project, and the effect of searches on subsequent development is demonstrated. Discussed are problems of planning and methods of preparation, including: (1) indicators of thematical literature; (2) reviews; (3) bibliographies and annotations; and (4) translations. K.W.

N66-39524# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ELECTRONIC DIGITAL COMPUTERS

L. K. Golyshev 1 Apr. 1966 57 p Transl. into ENGLISH of Chapter 14 of the book "Elektronnye Tsifrovyye Vychislitel'nyye Mashiny" Kiev, Izd. Tekhn., 1965 p 382-424

(FTD-MT-66-05; TT-66-62102; AD-637429) CFSTI: HC $3.00/MF $0.50

Contents: Machines for solution of scientific and engineering problems; calculating systems; peculiarities of specialized digital computers for scientific and engineering investigations; machines for solution of planning and economic problems; information about control systems prospects of application of electronic digital computers. TAB

N66-39977*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE UTILIZATION OF TECHNOLOGICAL RESOURCES

James E. Burnett Washington, NASA, 1966 20 p refs For presentation at the Automotive Eng. Congr. and Exposition, Detroit, 9-13 Jan. 1967; sponsored by Automotive Engr.

(NASA-TM-X-52248) CFSTI: HC $1.00/MF $0.50 CSCL 05C

The skillful use of new technology has long been a factor in industrial growth, and in recent years it has become the controlling variable determining competitive success. An unusual communication experiment between NASA and the petroleum industry clearly demonstrates the fact that aerospace-related new technology has a substantial content of industrial value. A number of examples are given illustrating this fact. The entire body of aerospace-related technology is now fully and selectively available to industry on a regular working basis through special NASA programs. As a consequence, the technological resources for considered use by any interested company are very large and of demonstrated value. Author

N66-39574# Lehigh Univ., Bethlehem, Pa. Center for the Information Sciences.

THE APPLICATION OF PSYCHOMETRIC TECHNIQUES TO DETERMINE THE ATTITUDES OF INDIVIDUALS TOWARD INFORMATION SEEKING AND THE EFFECT OF THE INDIVIDUAL'S ORGANIZATIONAL STATUS ON THESE ATTITUDES

Victor Rosenberg (M.S. Thesis) Jul. 1966 53 p refs

(Grants AF-AFOSR-724-66; NSF GE-2569)

(Rept.-2; AD-637713) CFSTI: HC $3.00/MF $0.50

A structured questionnaire was administered to professional personnel in industrial and government organizations, asking the subjects to rank eight information gathering methods according to their preference in given hypothetical situations. The subjects were then asked to rate the methods on a seven point scale according to (a) ease of use and (b) amount of information expected. A statistical analysis of the data from 94 subjects (52 in research, 44 in nonresearch) showed that no statistically significant differences were present in either the rankings or ratings between research and nonresearch personnel. A high significant correlation was found, however, between the preference ranking and the ease of use rating within both groups, whereas no significant correlation was found between the preference ranking and the amount of information ratings. The results of the study infer that the ease of use of an information gathering method is more important than the amount of information expected for information gathering methods in industrial and governmental environments, regardless of the research orientation of the users. (Author) TAB

N66-39602# System Development Corp., Santa Monica, Calif.

DEVELOPMENT OF EQUATION FOR ESTIMATING THE COSTS OF COMPUTER PROGRAM PRODUCTION

V. La Bolle Bedford, Mass., AFSC, Electron Systems Div., Jun. 1966 57 p

(Contract AF 19(628)-5166)

(TM-2918/000/00, ESD-TR-66-350; AD-637760) CFSTI: HC $3.00/MF $0.50

The report summarizes System Development Corporation (SDC) Technical Memorandum TM-2712 (AD-631 259). Additional sets of equations are given. Each set contains four equations; each equation shows how to form an estimate for one of the cost measures--number of man months, computer hours, new machine language instructions, months elapsed--by combining numerical values for selected factors that influence these costs. This report reviews the development of these equations including the application of statistical methods such as correlation and multivariate regression to experience data that characterize 74 computer programming efforts completed at SDC. The earlier work in the first cycle, a similar analysis of data for 27 SDC computer programming efforts, is also described. After the publication of TM-2712, the second cycle was continued by additional analysis of the same SDC data for 74 computer programming efforts. The aim of the additional work was to improve the estimating precision of the equations presented in TM-2712. The improvements reported were achieved by deriving new cost equations, one set based upon a truncated sample and then three sets based upon three subsamples of the data. An interim evaluation of the work completed in the first and second cycles presents proposed improvements in approach and research methods Author (TAB)

N66-39948*# National Aeronautics and Space Administration, Washington, D. C.

[THE IMPACT OF THE TECHNOLOGICAL REVOLUTION]

Robert C. Seamans 26 Oct. 1966 18 p Presented to Board of Trade Meeting, New York, 27 Oct. 1966 Available from the Scientific and Technical Information Division CSCL 22A

A variety of space program related topics are discussed including the technological revolution, its impact, and future implications; some of the products of the space age technology and their applications to society; the interdisciplinary nature of the space effort; and the new trend in engineering schools of combining training, research, and practical application. R.N.A.